



Article scientifique

Article

2013

Published version

Open Access

This is the published version of the publication, made available in accordance with the publisher's policy.

Mood Congruence Effect in Autobiographical Recall: Is Mood a Mediator ?

Drace, Sasa; Desrichard, Olivier

How to cite

DRACE, Sasa, DESRICHARD, Olivier. Mood Congruence Effect in Autobiographical Recall: Is Mood a Mediator ? In: Psihologija, 2013, vol. 46, n° 3, p. 217–228. doi: 10.2298/psi130525001d

This publication URL: <https://archive-ouverte.unige.ch/unige:29892>

Publication DOI: [10.2298/psi130525001d](https://doi.org/10.2298/psi130525001d)

Mood Congruence Effect in Autobiographical Recall: Is Mood a Mediator?¹

Sasa Drače¹ and Olivier Desrichard²

¹University of Sarajevo, Bosnia-Herzegovina

²Université de Geneve, Suisse

In the present study we test the hypothesis that the effect of mood congruence in autobiographical recall is underlain by mood. Thirty-eight female participants were subjected to positive, negative and neutral mood inductions, and then asked to recall three personal memories. Participants' mood was assessed using self-report questionnaires and by electromyograph (EMG) measurements of corrugator supercilii and zygomaticus major muscle activity. We replicated the congruence effect between the mood inductions and the valence of the participants' recalled memories. Furthermore, this effect was mediated by mood, as measured by EMG and self-report questionnaires. The results suggest that mood influences the mood congruence effect in a way that cannot be explained by semantic priming alone.

Key words: Mood congruence, autobiographical recall, affective priming, semantic priming

Many studies have shown that when a subject is asked to recall autobiographical memories, the affective valence of the recalled memories is congruent with the subject's mood (for a review, see Blaney, 1986). For instance, Snyder and White (1982) observed that participants who were exposed to a positive mood induction tended to recall happy personal experiences (e.g., getting a good grade), whereas those exposed to a negative mood induction recalled fewer happy and more unpleasant personal experiences (e.g., break up of a romantic relationship). Although the mood congruence effect has been observed in a large number of studies, the role of mood in this phenomenon remains uncertain. Some authors have gone as far as proposing purely cognitive explanations for the mood congruence effect, thereby denying that affective state has any influence at all. The present study was designed to determine whether or not mood plays a role in the mood congruence effect.

Affective explanations of mood congruence

Bower's (1981) associative network theory provides an attractive explanation for the mood congruence effect. According to this theory, emotions form nodes that are organized into memory networks containing

information that shares the same valence. When an emotion node is activated by emotional information in the environment (e.g., a mood induction procedure), congruent thoughts in memory are activated and thus become more accessible. Consequently, negative memories come to mind more easily when individuals are in a negative mood and positive memories come to mind more easily when individuals are in a positive mood. Another explanation of the mood congruence effect is drawn from the affect-as-information model (Schwarz, 2001; Schwarz & Clore, 1983). According to this *approach*, people use their momentary feeling states as diagnostic information for making evaluative judgments about a specific object. For example, when asked to recall an autobiographical memory related to a specific period in one's life, people's initial reactions are evaluative in that they ask themselves the question: "What was my life like at that time?" This would be affected by current mood. As a result, people who are in a good mood will make more positively biased assessments of the life period in question whereas people who are in a bad mood will make more negatively biased assessments. This general appraisal will then cue the search for relevant autobiographical episodes, so that the recall is more likely to be mood congruent.

Cognitive Explanations of Mood Congruence

Although Bower's and Schwarz's explanations are divergent about the mediating mechanisms involved (mood as information *versus* mood as primer), they both suppose that the subject's affective state is the factor causing the mood congruence. An alternative explanation that is frequently proposed in the literature questions the reliability of affect-based explanations. According to this explanation, the mood congruence effect can be explained by semantic priming. Some authors argue that the mood-inducing situation also carries semantic content that can directly prime similar cognitions and material in memory (e.g., Blaney, 1986; Rholes, Riskind, & Lane, 1987). Subsequently, the cognitions activated by the situation can semantically prepare or guide cognitive processes such as recalling autobiographical episodes. As a result, the mood congruency observed in the literature can be seen as a form of the classic semantic priming effect (Higgins & King, 1980), which is independent of an individual's affective state. From a theoretical point of view, the affective and cognitive explanations of mood congruency are not incompatible. Nevertheless, if mood congruence is solely due to cognitive effects, studying mood congruency would not further delve into the relation between emotions and cognitions (Ehrlichman & Halpren, 1988).

Is Mood involved?

When addressing this question, researchers have usually tried to isolate the influence of mood by selecting mood induction procedures that are supposed not to activate semantic concepts that are congruent with the material to be recalled. There are, however, two problems with this approach. First, studies of

this type often produce contradictory findings, with some concluding that the mood congruence effect is not caused by an individual's affective state (Mayer, Gayle, Meehan, & Haarman, 1990; Rholes et al., 1987; Riskind, 1983; Riskind, Rholes, & Eggers, 1982), and others suggesting the opposite (Ehrlichman & Halpren, 1988; Kumari, Hemsley, Cotter, Checkley, & Grey, 1998; Schnall & Laird, 2003). Second, the methodology used in this type of study does not allow us to confirm the validity of the affective hypothesis. In fact, even more naturalistic mood-induction procedures, which are supposed to be semantically unintrusive, can incidentally activate cognitions whose effect could be mistaken for the effect of mood. Ehrlichman and Halpren (1988) highlighted this point in a study that used pleasant vs. unpleasant odors to manipulate mood: "*it is also possible that the odors did produce an experience that involved at least some degree of self-reference. That is, in response to, say, an unpleasant odor, a person's phenomenology could be characterized [...] as "I feel disgusted." As the latter response focuses on the person [...], it could conceivably call forth self-schemata and elaborated cognitive structures that could then bias retrieval*" (p. 777). Despite much research into the subject, the debate over the role of mood has not been satisfactorily resolved (see Wyer, Clore, & Isbell, 1999).

THE PRESENT STUDY

The question of whether the mood congruence effect is a consequence of an individual's affective state or a result of semantic priming remains to be answered. As stated above, the roles of these two mechanisms cannot be distinguished using mood induction procedures (Ehrlichman & Halpren, 1988); therefore, other methods must be developed if we are to determine the influence of affect. In the present study we propose to identify the role of mood using a mediation analysis. If, as we think, mood is involved in the mood congruence effect, it should be possible to measure it after the induction procedure, and to test a mediation hypothesis: the induction procedure should impact the mood which should in turn influence memory recall. Participants were subjected to a mood induction procedure in order to activate a positive, neutral or negative mood, and then they were asked to recall three autobiographical memories. Self-report questionnaires and physiological measures were used to assess each participant's affective state during the experiment. In line with the results of previous studies, we expected the valence of the recalled memories to be congruent with the induced mood. Based on the assumption that affective state plays a role in the mood congruence effect, we hypothesized that mood mediates the main effect of the mood induction on the valence of the autobiographical recall.

Method

Participants. Participants were 38 female psychology undergraduates (M age = 21.4, SD = 5.85) from the University of Savoie. By taking part in the experiment, the participants fulfilled a research participation course requirement. As there were many more female psychology students than male psychology students, participation was limited to females to maximize

recruitment and to avoid variability in our physiological measures caused by gender-specific differences in facial expressions (facial expressions are strongly related to socially induced gender roles, e.g., display rules, Ekman, 1993).

Mood induction procedure. We developed a combined mood induction procedure (MIP; Drace, Desrichard, Shepperd & Hoorens, 2009; Drace, Ric & Desrichard, 2010) that simultaneously associated two non-verbal MIPs: a “Musical MIP” (e.g., Niedenthal & Setterlund, 1994) and a “Pictorial MIP” (e.g., Bradley, Cuthbert, & Lang, 1996). During a period of 10 minutes, participants were asked to look at a series of pictures while listening to music. We selected pictures from the *International Affective Picture System* (IAPS; Lang, Bradley, & Cuthbert, 1995). Pretesting, in which participants rated a set of IAPS items (1 = *negative*; 9 = *positive*), was used to select 26 pictures for the negative mood condition ($M = 2.3$, $SD = 0.37$, *Range* 1.8 to 3.2), 26 pictures for the neutral mood condition ($M = 5.0$, $SD = 0.26$, *Range* 4.6 to 5.3) and 26 pictures for the positive mood condition ($M = 7.3$, $SD = 0.32$, *Range* 6.7 to 8.1)¹. The negative mood pictures depicted among others scenes: traffic and plane accidents, cemeteries, a drug addict, crying children and ecological disaster. The positive mood pictures depicted among others scenes: babies, animals, landscapes, family idylls, couples, athletes involved in sports. The neutral mood pictures depicted among others scenes: affectively neutral human faces, furniture, utensils and abstract art. The music was drawn from selections used in prior mood research (Niedenthal, Halberstadt, & Setterlund, 1997; Niedenthal & Setterlund, 1994). Participants in the positive mood condition listened to selections from Mozart’s *Eine Kleine Nachtmusik* and *Divertimento #136*, and from Vivaldi’s *Mandolin Concertos*. Participants in the neutral mood condition listened to selections from Brahms’s *Symphony No. 1 in C Minor*. Participants in the negative mood condition listened to selections from Mahler’s *Adagietto*.

Measures.

BMIS. Participants’ mood was assessed using the Brief Mood Introspection Scale (BMIS; Mayer & Gaschke, 1988). The BMIS consists of 16 items pertaining to affective states (e.g., *sad, happy, lively, gloomy*, etc.). Participants had to rate, on a 4-point scale, the extent to which she felt each state at “that moment”. A BMIS score was calculated for each participant by subtracting the sum of the scores obtained for negative items ($\alpha = .73$) from the sum obtained for positive items ($\alpha = .78$). The higher a participant’s BMIS score, the more positive her mood.

EMG. Prior work has shown that the electromyographic (EMG) activity of the corrugator supercillii and zygomaticus major muscles is a highly reliable indicator of both the valence and the intensity of a person’s affective state (Cacioppo, Petty, Losch, & Kim, 1986). The corrugator supercillii muscles are involved in frowning, which is symptomatic of individuals’ facial expressions when they are in a negative mood, and the zygomaticus major muscles are involved in smiling, which typically indicates a positive mood. The EMG activities of the corrugator supercillii and zygomaticus major muscles were recorded via four “EL 503” electrodes (Biopac Systems, Inc., Santa Barbara, CA). In order to optimize signal quality, the electrodes were attached following the recommendations of Fridlund and Cacioppo (1986). Data was recorded using a Biopac Lab PRO System. The amplified (x5) signals were digitized at a frequency of 1000 HZ and displayed on the screen as continuous lines. We only retained recordings for periods during which the participants were not looking at any pictures (i.e., a 5-second period between each picture and a 40-second period following the end of the mood

1 The following pictures were used for the mood inductions. Positive mood: 1460, 1463, 1610, 1710, 1721, 1750, 2057, 2070, 2080, 2091, 2165, 2304, 2311, 2340, 2341, 2345, 2360, 2530, 2550, 2660, 5779, 5780, 5982, 7580, 8370, 8420. Negative mood: 2205, 2710, 2750, 2900, 3180, 3220, 6212, 6213, 6530, 6550, 6570, 9000, 9041, 9050, 9220, 9280, 9415, 9421, 9520, 9560, 9611, 9630, 9830, 9910, 9911, 9920. Neutral mood: 2190, 2385, 2514, 2516, 2749, 2840, 2890, 5510, 5531, 5534, 7004, 7006, 7009, 7010, 7020, 7050, 7160, 7170, 7175, 7185, 7187, 7207, 7211, 7217, 7233, 7235.

induction procedure). There were two main reasons for this decision. First, IAPS pictures have been shown to trigger facial reactions that cause variations in corrugator supercilii and zygomaticus major EMG activity (Bradley et al., 1996; Lan, Greenwald, Bradley, & Hamm 1993), so it is impossible to know whether EMG activity during picture presentation is due to facial reactions to pleasant vs. unpleasant pictorial stimuli or to the general affective state of the participant. Second, reactions recorded during the picture presentation stage may also be the result of mimicry, as some pictures showed people's faces expressing joy and sadness (Hatfield, Cacioppo, & Rapson, 1994).

Physiological indicators of mood were obtained for each participant by calculating the average amplitude of the EMG signals produced by corrugator supercilii and zygomaticus major activity. Subsequent correlation analysis revealed good convergent validity between the corrugator supercilii and zygomaticus major EMG activities and the BMIS scores (respectively, $r = -.44$ vs. $.43$, $p < .05$).

Valence of memories. Five independent judges, who were blind to the hypotheses and to the participants' mood induction conditions, rated the memories on a 7-point scale (1 = *very negative*; 7 = *very positive*). As the consistency between judges was very high ($\alpha_s = .98, .97, .96$), we calculated a valence score for each memory by averaging the evaluations of the five judges.

Procedure. Participants took part individually. Each participant was randomly assigned to one of three mood induction conditions. In order to avoid experimenter demand bias, the instructions were designed to minimize the extent to which participants could infer that we were actually interested in mood or in the relationship between mood and autobiographical recall. In order to disguise the purpose of the research, the experimenter described the study as examining eyewitness testimony. Participants were told that the experiment would have three stages. Stage one involved viewing a series of pictures (viewing stage), which the participants were asked to look at very carefully, as they would be tested on what they had seen at the end of the experiment. Stage two consisted of a set of distraction tasks in which the participants were asked to complete questionnaires (distraction stage), ostensibly to simulate real eyewitness report situations, in which there is a time delay between seeing an event and describing it, during which a witness's attention is diverted by other stimuli. In stage three, the participants were asked to answer questions about the pictures (identification stage). The participants were told that the music they would be listening to throughout the experiment was designed to isolate them from environmental noises and to facilitate concentration on the pictures. The experimenter justified the presence of the EMG electrodes by explaining that the experiment required the measurement of skin conductivity during the viewing stage. At no time were the participants informed that the experimenter was interested in facial expressions.

When a participant had understood the procedure and been fitted with the EMG electrodes, she put on the headphones and the mood induction procedure began. Participants were shown each of the pictures for their condition for 15 seconds, with a gap of 5 seconds between pictures, during which time the screen was black.

After the mood induction, the experimenter reminded participants that before the identification stage they had to perform a distractive cognitive task. They were first asked to fill in a BMIS, and then they were given a sheet of paper bearing the instructions: "*Try to remember three events that happened to you during the previous school year. Write down a brief description of these memories in the order they occur to you. Your responses will be kept strictly confidential*". We asked about the previous school year in particular to make the task relevant to the students and to reduce the qualitative variability of the memories that participants reported. The instructions were followed by spaces for writing the three memories. Students who had not finished after 10 minutes were instructed to move on to the last memory as soon as they had finished the memory they were currently working on.

In the final stage of the procedure, the participants were asked to view a mixture of pictures that had and had not been presented during the mood induction stage. The main purpose of the identification stage was to ensure that the participants had paid attention to

the affective material. All the participants correctly identified the pictures they had seen and the pictures they had not seen during the mood induction stage. When they had finished, the participants were thanked and debriefed.

Results

We conducted mediation analyses (one for each mediating variable), following Baron and Kenny's (1986) recommendations. The means and standard deviations for both mood measures and for the valence of the autobiographical memories for each mood condition are presented in Table 1.

Table 1. Mean scores and standard deviations for EMG activity (μV), BMIS scores and the valence of the autobiographical memories for each mood condition.

Measures	Mood induction					
	Negative		Neutral		Positive	
	M	SD	M	SD	M	SD
	(n = 12)		(n = 12)		(n = 14)	
EMG						
Corrugator supercilii	0.98	0.26	0.67	0.21	0.65	0.07
Zygomaticus major	0.67	0.09	0.73	0.15	1.13	0.39
Composite score	-0.31	0.26	0.06	0.25	0.48	0.4
BMIS	0	7	9.16	5.95	10.78	5.75
Valence of recall	3.52	1.21	4.42	1.13	4.65	0.94

Effect of mood induction on autobiographical memory recall

In line with the first step of the mediation analysis procedure, we tested whether or not mood induction had an effect on the dependent variable, which was obtained by calculating the mean score of the three recalled memories for each participant. We expected the variations in the valence of the autobiographical memories to be congruent with the valence of the mood induction. To test this hypothesis, we conducted one-way ANOVAs with two orthogonal contrasts: a planned comparison testing the linear model and a contrast testing the remaining variance (i.e., the only contrast that should not be significant if the model tested fits the data). The test for the planned comparison, which opposed the negative and positive mood conditions (negative = -1, neutral = 0, positive = 1), was significant, $F(1, 35) = 8.36$, $p < .006$. Importantly, the orthogonal contrast, opposing neutral mood condition to both the negative and positive mood conditions (negative = 1, neutral = -2, positive = 1), was not significant, $F < 1$. As Table 1 shows, the participants in the negative mood condition reported fewer positive memories than participants in the neutral mood condition, who, in turn, reported less positive memories than participants in the positive mood condition.

Effect of mood inductions on mood indicators

The second condition of the mediation analysis involves an independent variable effect on the mediating variable. To test for this condition we separately analyzed the effect of mood induction on the BMIS and on EMG activity.

Mood induction and the BMIS. Participants in the negative mood condition were expected to be in a more negative mood than those in the neutral mood condition, who, in turn, were expected to be in a more negative mood than participants in the positive mood condition. The planned comparison testing the linear model was significant, $F(1, 35) = 19.34$, $p < .0001$, and the orthogonal contrast testing the remaining variance was not significant, $F(1, 35) = 3$, $p < .09$. Participants in the negative mood condition reported less positive mood than participants in the neutral mood condition, who, in turn, reported less positive mood than participants in the positive mood condition (Table 1).

Mood inductions and EMG activity. Previous work has shown that corrugator supercillii EMG activity can be used to detect negative mood and that zygomaticus major EMG activity can be used to detect positive mood (Cacioppo et al., 1986). Hence, we expected participants in the negative mood condition to show greater corrugator supercillii EMG activity than the participants in the neutral and positive mood conditions, for whom the levels of corrugator supercillii EMG activity were expected to be similar. To test this hypothesis, we conducted a one-way ANOVA with two orthogonal contrasts. The planned comparison opposed the negative mood condition to both the neutral and positive mood conditions (negative = -2, neutral = 1, positive = 1). This test was significant, $F(1, 35) = 23.1$, $p < .0001$. Importantly, the contrast of the neutral mood condition with the positive mood condition (negative = 0, neutral = -1, positive = 1) was not significant, $F < 1$. The participants in the negative mood condition demonstrated greater corrugator supercillii EMG activity than the participants in the neutral and positive mood conditions (Table 1). For zygomaticus major activity, the planned comparison used to test our hypothesis opposed the positive mood condition to both the neutral and the negative mood conditions (negative = -1, neutral = -1, positive = 2). As expected, this test yielded a significant effect, $F(1, 35) = 24.1$, $p < .0001$, and the contrast between the neutral mood condition and the negative mood condition (negative = -1, neutral = 1, positive = 0) was not significant, $F < 1$. Thus, the participants in the positive mood condition demonstrated greater zygomaticus major EMG activity than the participants in the neutral and negative mood conditions (Table 1).

In order to carry out further mediation analysis, we created a single physiological indicator of mood for each participant by subtracting the mean amplitude of the corrugator supercillii EMG activity from the zygomaticus major EMG activity (higher scores indicate more positive mood). The linear planned comparison opposing the positive and negative mood conditions was significant, $F(1, 35) = 40.83$, $p < .0001$, and the orthogonal contrast testing remaining variance was not significant ($F < 1$). The participants in the negative mood condition had lower composite EMG scores than the participants in the neutral mood condition, who had lower composite EMG scores than the participants in the positive mood condition (Table 1).

Mediation tests

For each mediator (BMIS and composite EMG scores) we tested a statistical model that included both the induction effect and the mediator effect. For the BMIS, the results indicate that the observed effect of mood induction on the valence of autobiographical memories disappeared when the BMIS effect was controlled in the same model ($\beta = .13$, ns), and the effect of the BMIS score on the valence of the autobiographical recall was significant ($\beta = .46$, $p < .01$). Similar results were observed when we analyzed the composite EMG score as a mediator. The effect of mood induction on the valence of the autobiographical recall was no longer significant ($\beta = -.19$, ns), whereas the EMG effect on the valence of autobiographical recall was significant ($\beta = .80$, $p < .0001$).

DISCUSSION

The purpose of the present study was to test the hypothesis that mood underlies the mood congruence effect in autobiographical recall. Unlike many previous studies, we did not try to use a mood induction procedure that was entirely without semantic content. Our approach involved testing whether or not the mood congruence effect used the “affective path”, that is to say, in operational terms, whether or not it was mediated by the participants’ mood. In line with previous research, we found a congruency between the valence of the induced mood and the valence of the autobiographical memories (Blaney, 1986; Snyder & White, 1982). Importantly, as we expected, the effect of induced mood on autobiographical recall was mediated by the participants’ affective state. Furthermore, this finding was independent of mood indicator. In fact, our results showed that both self-report (BMIS) and composite EMG scores had an effect on recall in regression models where the induction effect was controlled.

Mood effect or semantic priming?

If our findings are consistent with both the associative and the affect as information approaches (Bower, 1981; Schwarz, 2001) it would be difficult to interpret them in terms of semantic priming. According to the semantic priming hypothesis, the mood congruence effect is mediated by the semantic content of the induction procedure. However, this hypothesis cannot explain why, as our results show, the effect of induction is mediated by mood measures. It could be argued that the participants’ verbal responses to the BMIS items were contaminated by the content of the IAPS pictures. If this were the case, it would mean that the BMIS was merely an indirect measure of the semantic aspects activated by the situation: a hypothesis that is disproved by a number of factors. For example, the BMIS has been found to be sensitive to mood manipulation using a variety of induction procedures, even those with low semantic content

(e.g., Niedenthal & Setterlund, 1994). In addition, research has shown that working on positive or negative cognitive material plays a role in subsequent cognitive tasks, but does not change a participant's mood as assessed by the BMIS (Innes Ker & Niedenthal, 2002). Taken together, these findings suggest that the semantic content of the mood induction procedures only has a very minor influence on mood as measured by the BMIS. Even if the BMIS were influenced by semantic activation, this influence would be so weak as to rule out any possibility of complete mediation. Similar results were also obtained for the measures of EMG activity, a parameter that is considered to be even less affected by the semantic content of the induction procedure.

One could question the generalization of our findings, as we know that our population was composed only of female participants. As we already explained, by choosing female participants our purpose was to reduce all between subject variations except those induced by our manipulations (see also Dimberg & Thunberg, 1998). However, these variations, which could come from gender differences, were potentially related to the efficacy of mood inductions and physiological measurement (i.e., EMG recording) but not to the autobiographical recall. In line with this idea, women have been found to be more sensitive to mood inductions (Westermann, Spies, Stahl, & Hesse, 1996) and more facially expressive than man (Schwartz, Brown, & Ahern, 1980) particularly when exposed to facial stimuli (Dimberg & Lunquist, 1990). In addition, research also suggests that the emotion expressions can be moderated by cultural norms (Ekman, 1993). On the other side, it has been suggested that mood congruence in autobiographical recall is a general and well established effect (Blaney, 1986) and we don't know of any research that clearly indicates difference between males and females.

Mood effect or experimenter demand?

Another potential explanation for our results is that they are artifacts of experimenter demand. Although we used a cover story to divert attention from mood manipulation and its relation to the recall task, it could be argued that participants exposed to the positive and negative affective stimuli may have guessed the purpose of the study and thus simulated their responses in order to comply with the experimenter's hypothesis. This explanation seems plausible, as we know that individuals possess lay theories consistent with the mood congruence effect (Eich & Macaulay, 2000). Consequently, rather than being due to the participants' affective state, our findings may simply reflect a social desirability bias. However, although this explanation could apply to the analysis of the BMIS scores, it cannot explain the results obtained using the physiological measures. Even if the participants simulated (or mimicked) facial expressions when viewing the affective stimuli, the risk of assessing voluntary expressions was minimized by the fact that we only took into account the EMG activity recorded during the time intervals between pictures.

CONCLUSION

Our results show that affective state plays a role in the relationship between the mood congruence phenomenon and autobiographical recall, and that this relationship cannot be entirely explained by semantic priming. Moreover, the complete mediation we found between affective state and autobiographical recall could be taken to indicate that semantic priming does not play any role in the mood congruence effect. However, the null-effect of induction when mood is controlled may be the consequence of a lack of statistical power rather than an indication of complete mediation (Fritz & MacKinnon, 2007). Furthermore, previous research suggests that semantic priming does play a role in the mood congruence effect and that cognitive explanations cannot be excluded. Hence, it is likely that both cognitive and affective mechanisms are involved. The challenge for future research is to identify the respective weight of each of these mechanisms in the mood congruence effect.

REFERENCES

- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality And Social Psychology*, *51*(6), 1173–1182. doi: 10.1037/0022–3514.51.6.1173
- Blaney, P. H. (1986). Affect and memory: A review. *Psychological Bulletin*, *99*(2), 229–246. doi: 10.1037/0033–2909.99.2.229
- Bower, G. H. (1981). Mood and memory. *American Psychologist*, *36*(2), 129–148. doi: 10.1037/0003–066X.36.2.129
- Bradley, M. M., Cuthbert, B. N., & Lang, P. J. (1996). Picture media and emotion: Effects of a sustained affective context. *Psychophysiology*, *33*(6), 662–670. doi: 10.1111/j.1469–8986.1996.tb02362.x
- Cacioppo, J. T., Petty, R. E., Losch, M. E., & Kim, H. (1986). Electromyographic activity over facial muscle regions can differentiate the valence and intensity of affective reactions. *Journal of Personality and Social Psychology*, *50*(2), 260–268. doi: 10.1037/0022–3514.50.2.260
- Dimberg, U., & Lundqvist, L., O. (1990). Gender differences in facial reactions to facial expressions. *Biological Psychology*, *30*(2), 151–159. doi: 10.1016/0301–0511(90)90024-Q
- Dimberg, U., & Thunberg, M. (1998). Rapid facial reactions to emotion facial expressions. *Scandinavian Journal of Psychology*, *39*(1), 39–46. doi: 10.1111/1467–9450.00054
- Drace, S., Desrichard, O., Shepperd, A. J., & Hoorens, V. (2009). Does mood really influence comparative optimism? Tracking an elusive effect. *British Journal of Social Psychology*, *48*(4), 579–599. doi: 10.1348/014466608X387098
- Drace, S., Ric, F., Desrichard, O. (2010). Affective biases in likelihood perception: A possible role of experimental demand in mood congruence effect. *Revue Internationale de Psychologie Sociale*, *23*(1), 93–110. doi: 10.1037/t06259–000
- Ehrlichman, H., & Halpern, J. N. (1988). Affect and memory: Effects of pleasant and unpleasant odors on retrieval of happy and unhappy memories. *Journal of Personality and Social Psychology*, *55*(5), 769–779. doi: 10.1037/0022–3514.55.5.769
- Eich, E., & Macaulay, D. (2000). Are real moods required to reveal mood-congruent and mood-dependent memory? *Psychological Science*, *11*(3), 244–248. doi: 10.1111/1467–9280.00249

- Ekman, P. (1993). Facial expression and emotion. *American Psychologist*, 48(4), 384–392. doi: 10.1037/0003-066X.48.4.384
- Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology*, 23(5), 567–589. doi: 10.1111/j.1469-8986.1986.tb00676.x
- Fritz M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, 18(3), 233–239. doi: 10.1111/j.1467-9280.2007.01882.x
- Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). *Emotional contagion*. Cambridge: Cambridge University Press.
- Higgins, E. T., & King, G. (1980). Accessibility of social constructs: Information processing consequences in individual and contextual variability. In N. Cantor & J. F. Kihlstrom (Eds.), *Cognition, social interaction and personality* (pp. 129–162). Hillsdale, NJ: Erlbaum.
- Innes-Ker, Å., & Niedenthal, P. M. (2002). Emotion Concepts and Emotional States in Social Judgment and Categorization. *Journal of Personality and Social Psychology*, 83(4), 804–816. doi: 10.1037/0022-3514.83.4.804
- Kumari, V., Hemsley, D. R., Cotter, P. A., Checkley, S. A., & Gray, J. A. (1998). Haloperidol-induced mood and retrieval of happy and unhappy memories. *Cognition and Emotion*, 12(4), 497–508. doi: 10.1080/026999398379538
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1995). *International affective picture system (IAPS): Digitized photographs, instruction manual and affective ratings*. Gainesville, FL: The Center for Research in Psychophysiology, University of Florida.
- Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral, and behavioral reactions. *Psychophysiology*, 30(3), 261–273. doi: 10.1111/j.1469-8986.1993.tb03352.x
- Mayer, J. D., & Gaschke, Y. N. (1988). The experience and meta-experience of mood. *Journal of Personality and Social Psychology*, 55(1), 102–111. doi: 10.1037/0022-3514.55.1.102
- Mayer, J. D., Gayle, M., Meehan, M. E., & Haarman, A.-K. (1990). Toward better specification of the mood-congruency effect in recall. *Journal of Experimental Social Psychology*, 26(6), 465–480. doi: 10.1016/0022-1031(90)90051-M
- Niedenthal, P. M., Halberstadt, J. B., & Setterlund, M. B. (1997). Being happy and seeing “happy”: Emotional state mediates visual word recognition. *Cognition and Emotion*, 11(4), 403–432. doi: 10.1080/026999397379863
- Niedenthal, P. M., & Setterlund, M. B. (1994). Emotion congruence in perception. *Personality and Social Psychology Bulletin*, 20(4), 401–411. doi: 10.1177/0146167294204007
- Rholes, W. S., Riskind, J. H., & Lane, J. W. (1987). Emotional states and memory biases: Effects of cognitive priming and mood. *Journal of Personality and Social Psychology*, 52(1), 91–99. doi: 10.1037/0022-3514.52.1.91
- Riskind, J. H. (1983). Nonverbal expressions and the accessibility of life experience memories: A congruence hypothesis. *Social Cognition*, 2(1), 62–86. doi: 10.1521/soco.1983.2.1.62
- Riskind, J. H., Rholes, W. S., & Eggers, J. (1982). The Velten mood induction procedure: Effects on mood and memory. *Journal of Consulting and Clinical Psychology*, 50(1), 146–147. doi: 10.1037/0022-006X.50.1.146
- Schnall, S., & Laird, J. D. (2003). Keep smiling: Enduring effects of facial expressions and postures on emotional experience and memory. *Cognition and Emotion*, 17(5), 787–797. doi: 10.1080/02699930302286
- Schwartz, G. E., Brown, S.-L., & Ahern, G. L. (1980). Facial Muscle Patterning and Subjective Experience During Affective Imagery: Sex Differences. *Psychophysiology*, 17(1), 75–82. doi: 10.1111/j.1469-8986.1980.tb02463.x
- Schwarz, N. (2001). Feelings as information: Implications for affective influences on information processing. In L. L. Martin & G. L. Clore. *Theories of mood and cognition: A user's guidebook* (pp. 159–176). Mahwah, NJ: Lawrence Erlbaum Associates Publishers.

- Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology, 45*(3), 513–523. doi: 10.1037/0022-3514.45.3.513
- Snyder, M., & White, P. (1982). Moods and memories: elation, depression, and remembering of the events of one's life. *Journal of Personality, 50*(2), 149–167. doi: 10.1111/j.1467-6494.1982.tb01020.x
- Westermann, R., Spies, K., 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. doi: 10.1002/(SICI)1099-0992(199607)26:4<557::AID-EJSP769>3.0.CO;2-4
- Wyer, R. S., Jr., Clore, G. L., & Isbell, L. M. (1999). Affect and information processing. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (pp. 1–77). San Diego, CA: Academic Press. doi: 10.1016/S0065-2601(08)60271-3