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The psychology of creativity : moods, minds, and motives

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A Meta-Analysis of 25 Years of Mood–Creativity Research:
Hedonic Tone, Activation, or Regulatory Focus?

This meta-analysis synthesized 102 effect sizes reflecting the relation between specific moods and creativity. Effect sizes overall revealed that positive moods produce more creativity than mood-neutral controls ($r = .15$), but no significant differences between negative moods and mood-neutral controls ($r = .03$) or between positive and negative moods ($r = .04$) were observed. Creativity is enhanced most by positive mood states that are activating and associated with an approach motivation and promotion focus (e.g., happiness), rather than those that are deactivating and associated with an avoidance motivation and prevention focus (e.g., relaxed). Negative, deactivating moods with an approach motivation and a promotion focus (e.g., sadness) were not associated with creativity, but negative, activating moods with an avoidance motivation and a prevention focus (fear, anxiety) were associated with lower creativity, especially when assessed as cognitive flexibility. With a few exceptions, these results generalized across experimental and correlational designs, populations (students vs. general adult population), and facet of creativity (e.g., fluency, flexibility, originality, eureka/insight). The authors discuss theoretical implications and highlight avenues for future research on specific moods, creativity, and their relationships.

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To survive, people need to adapt to changing circumstances. To prosper, people need to solve problems, generate new insights, and create new products and services. Put differently, critical to both survival and prosperity is creativity—the creation of something new and unusual meant to improve one’s effective functioning (Amabile, 1983; Eysenck, 1993; Runco, 2004; Simonton, 2003). Accordingly, creativity has been studied in the psychological sciences for decades, most notably since Guilford’s (1950) address to the American Psychological Association, in which he pleaded for the systematic study of creativity within psychology. Creativity research now has its own place within most of the traditional sub-areas in psychology, including social, organizational, personality, cognitive, clinical, and child psychology.

Within these different sub-areas, mood stands out as one of the most widely studied and least disputed predictors of creativity (e.g., Isen & Baron, 1991; Mumford, 2003). The popularity of mood as a predictor of creativity is partly due to the fact that mood often serves as an intermediary state between a host of situational and personality predictors, on the one hand, and creative performance, on the other. Thus, once we understand how mood relates to creativity, we may infer from the ways in which leadership influences employee mood how leadership relates to employee creativity (e.g., George & Zhou, 2002). Likewise, from the ways in which group conflict influences individual moods, we may infer how conflict relates to group creativity (e.g., Carnevale & Probst, 1998; De Dreu & Nijstad, 2008). Additionally, from the way preliminary task performance shapes emotion states, we may infer how such task performance relates to creative performance on a subsequent task (e.g., Madjar & Oldham, 2002).

In general, the mood-creativity literature breaks down into three separate, yet interrelated, lines of inquiry. First, there is a large amount of work comparing positive moods with affect-neutral control conditions. In summarizing this line of work, Ashby and colleagues (1999) concluded “It is now well recognized that positive affect leads to greater cognitive flexibility and facilitates creative problem solving across a broad range of settings” (p. 530). In a similar vein, Lyubomirsky et al. (2005) stated “people in a positive mood are more likely to have richer associations within existing knowledge structures, and thus are likely to be more flexible and original. Those in a good mood will excel when the task is complex and past learning can be used in a heuristic way to more efficiently solve the task or when creativity and flexibility are required” (p. 840). However, this general conclusion is countered by important exceptions suggesting that people in a positive

mood are sometimes less creative than those in mood-neutral control conditions (e.g., T. A. Anderson & Pratarelli, 1999; Kaufmann & Vosburg, 1997).

The second general line of inquiry compares negative mood states with affect-neutral control conditions. This relatively large literature shows, unfortunately, contradictory findings. Whereas some studies show that negative, relative to neutral, moods promote creative performance (e.g., Adaman & Blaney, 1995; Carlsson, Wendt, & Risberg, 2002; Clapham, 2001), others show a negative effect (e.g., Mikulincer, Kedem, & Paz, 1990a; Vosburg, 1998a), or no difference between negative and neutral moods (e.g., Goritz & Moser, 2003; Verhaeghen, Joormann, & Khan, 2005). These inconsistencies led some to suggest that “research has consistently shown that negative mood has no effect on creativity at either the individual (...) or the group (...) level” (Grawitch, Munz, Elliott, & Mathis, 2003, p. 205), and others to propose that new theories are required to address the complex relationship between negative affect and creative performance (e.g., Isen, 1990).

Third, and finally, there is extensive work on the mood-creativity relationship that directly compares positive with negative affective states (see Kaufmann, 2003). Given that the relationship between negative affective states and creative performance is complex, it is not surprising that this line of research is likewise plagued by inconsistent findings. Negative moods sometimes promote creative performance to a greater extent than do positive moods (e.g., Bartolic, Basso, Schefft, Glauser, & Titanic-Schefft, 1999; Gasper, 2003); yet other work shows that positive mood states trigger more creative responding than do negative mood states (e.g., Grawitch, Munz, & Kramer, 2003; Hirt, Melton, McDonald, & Harackiewicz, 1996).

Goal of the Meta-Analysis

Our goal in the current research was three-fold. First, the inconsistencies in research findings require, in our view, a meta-analytic review of the literature to arrive at a quantified insight into the strength and direction of mood effects on creative performance. Empirical and review work to date has focused on one of the three general areas of inquiry discussed thus far and has not arrived at a combined and integrated set of insights. For example, in their meta-analysis of the effects of positive mood on several outcome variables (e.g., health, prosocial behavior, problem solving), Lyubomirsky et al. (2005) already touched on the mood-creativity relationship, though focused on happiness only (and excluded other positive mood states such as serene or relaxed). Further, Lyubomirsky et al. analyzed work that compared happiness with a mood-neutral baseline or with negative moods, but did

not examine research that compared negative moods with a mood-neutral control condition. Accordingly, our first goal was to provide a meta-analytic review of the positive mood—neutral control, the negative mood—neutral control, and the positive mood—negative mood contrasts. This allowed for a systematic and side-by-side comparison and the opportunity to highlight and examine similarities and differences across these three general contrasts. Furthermore, both within and across these three contrasts, we examined a variety of study characteristics that could serve as boundary conditions on particular effects. We distinguished between experimental and correlational studies to address the issue of causality, and we examined whether the magnitude and direction of effects varies across population type (e.g., undergraduate students vs. general adult population), type of mood induction procedure, manipulation check features (e.g., strength of manipulation, report of manipulation checks), time available for a creativity task, and task framing (e.g., emphasizing enjoyment standards vs. performance standards).

Second, and in spite of the fact that creativity is a multi-faceted concept (Mumford & Gustafson, 1988; Simonton, 2003) consisting of facets such as fluency, flexibility, and originality, past work on mood and creativity tended to lump various facets of creative performance together, to treat them interchangeably, or to focus on a particular facet of creativity to the exclusion of some others. In the present study, we examined whether or not this tendency is justified, that is, whether mood states influence various facets of creativity in qualitatively different ways.

Third, and finally, past work on mood and creativity has primarily focused on the valence, or hedonic tone, of specific mood states. However, mood states can be distinguished on the basis of other dimensions as well, some of which are relevant to creative performance (De Dreu et al., 2008; Friedman & Förster, 2008; Higgins, 1997). That is, we suspect that the mood—creativity link may be understood in terms of a mood state's hedonic tone (positive vs. negative), the involved level of activation (activating vs. deactivating), its association with regulatory focus (promotion vs. prevention), or some combination. We develop these three possibilities and report on a meta-analytic assessment and comparison of their predictive validity.

Because our approach to the mood-creativity link accords an important role to various facets of creative performance, we begin with a brief overview of the multifaceted construct of creativity. We then discuss in more detail several dimensions underlying mood states and relate these to creative performance with resulting predictions about when, and to what extent, specific (clusters of) mood

states enhance creativity. Finally, we briefly discuss several study characteristics that potentially moderate the mood-creativity relationship, after which we turn to a report and discussion of our meta-analytic results.

Creative Performance as a Multicomponent Construct

Creativity is generally conceived of as the generation of ideas, insights, or problem solutions that are both novel and potentially useful (e.g., Amabile, 1983; N. Anderson, De Dreu, & Nijstad, 2004; James, Brodersen, & Jacob, 2004; Paulus & Nijstad, 2003; Sternberg & Lubart, 1999). Despite consensus about the definition, a variety of operationalizations have been adopted in the creativity literature (Hocevar & Bachelor, 1989; Runco, 2004; Simonton, 2003; Treffinger, 1987). In the mood-creativity literatures, creative performance has been assessed with divergent thinking and idea generation tasks, insight tasks, and general creativity performance measures.

Although these and other tasks that are used to measure creative performance share important features, they also differ substantially. Mumford (2001) argued, for example, that divergent thinking tests and ideation tasks are open-ended and designed to assess the ability to generate multiple alternative solutions. Performance on these tasks can be decomposed into three distinct but interrelated components – fluency, cognitive flexibility, and originality (Guilford, 1967; Torrance, 1966). Fluency refers to the number of unique, non-redundant ideas or problem solutions that are generated. Flexibility refers to the breadth and number of distinct semantic categories that a person accesses and it reflects the capacity to switch approaches, goals, and sets. Someone who generates ideas within one category will be perceived as less flexible than someone who generates ideas from multiple categories. For example, when generating possible uses for a brick (e.g., Lamm & Trommsdorff, 1973), someone who only uses a brick to build something (e.g., a house, a street, a goal post) is less flexible than someone who (also) uses a brick as a musical instrument and a weapon. Finally, originality refers to the uncommonness and infrequency of an idea and reflects the ability to approach a problem or situation in a new way, without relying on routine or habitual thought. Note that originality is not the same as flexibility or fluency. Someone may generate only two ideas, but these may be highly original, whereas someone else may generate as many as 20 ideas, which are in fact very unoriginal. Similarly, someone may generate a number of highly original ideas within one semantic category,

whereas someone else may generate a number of unoriginal ideas within several different semantic categories.

In contrast to divergent thinking tests that are open-ended, insight or eureka tasks form another often used class of creativity tasks that have a single demonstrably correct solution (Simonton, 2003). Insight or eureka tasks typically require a mental restructuring of problem information that leads to a clear and sudden understanding of how to solve the problem (Bowden, Jung-Beeman, Fleck, & Kounios, 2005; Gilhooly & Murphy, 2005; Schooler & Melcher, 1995). A famous example is Duncker's (1945) candle problem in which participants must attach a candle to a wall, with only a book of matches and a box of tacks, in such a way that it will burn without dripping wax on the table or floor. The correct solution requires participants to realize that a box can be used not just as a container for the tacks, but also as a flat surface that can be attached to the wall and support the candle. Insight tasks show resemblance to the Remote Associates Test (Mednick, 1962), analogy tests, and anagram tasks. For example, the Remote Associates Test assesses the ability of individuals to identify associations among words that are not normally associated with each other. Participants are provided with three words (e.g., envy, golf, beans) and are instructed to generate a word that relates to all of these three words (i.e., green). To come up with the correct solution, participants need to break up the presented material to identify potentially correspondent attributes and relations associated with the three provided words. These insight tasks share the fact that only one solution is correct, and because the initial or dominant response is likely to be incorrect, at least some restructuring of the presented material is needed. Indeed, performance on the Remote Associates Test correlates with success on both classic insight problems (Schooler & Melcher, 1995), and anagram solving (Mednick, 1962).

Sometimes creative performance is not derived from performing a particular task, but rather derives from a proximal other's evaluative impressions. Thus, some work includes supervisor ratings of the creative performance of their employees or peer ratings of the creative performance of their co-workers (e.g., George & Zhou, 2001). Likewise, researchers have used ratings of poems, stories, collages, and buildings (Hocevar & Bachelor, 1989; Simonton, 2003). For example, Amabile (1985) instructed participants to write a simple form of unrhymed poetry (Haiku) consisting of five lines with a fixed format. Independent judges rated the poems, relative to each other, on a scale of creativity. These measures do not fall into the

fluency, flexibility, originality, or insight categories and form a distinct composite category of creative performance.

Distinguishing among different facets of creative performance is important because some facets of creative performance may be a function of different psychological mechanisms than others. For example, perseverance and achievement motivation relate to fluency within a few cognitive categories, but not to flexibility (frequent switching among cognitive categories; Fodor & Carver, 2000; Rietzschel et al., 2007a), and verbal overshadowing undermines the originality of ideas more than the sheer number of ideas being generated (De Vet & De Dreu, 2007). Moreover, some evidence indicates that affective states that influence fluency do not necessarily also influence originality and vice versa. For example, in the career of composer Robert Schumann, his manic states were related to increased quantity of his work but not to increased quality (Weisberg, 1994). In other words, by distinguishing different facets of creative performance we may enhance our understanding of the psychological processes involved in the mood-creativity link. In the present meta-analysis we thus distinguished among fluency, flexibility, originality, performance on insight/eureka tasks, and composite creativity as dependent variables.

Mood State and Creative Performance

In referring to emotional phenomena, the most commonly used terms are affect, mood, and emotion. *Affect* is the most general term, referring to a subjective feeling state that incorporates long-lasting mood states, such as cheerfulness or depression, as well as more specific ones, such as happiness or anger (Frijda, 1993). Mood and emotion are generally seen as subtypes of affect, with emotions being more strongly directed toward a specific stimulus—be it a person, an object, or an event (Frijda, 1993). For example, someone is angry because a traffic jam frustrates the goal of arriving at a concert in time. Moods lack this quality of object directedness; “a person in an irritable mood is not necessarily angry about anything in particular—he or she is just generally grumpy” (Parrott, 2001, p. 3). Specific moods tend to be relatively enduring and pervasive, if generally of rather low intensity (Frijda, 1993; see also Levenson, Ekman, & Friesen, 1990; Roseman, Wiest, & Swartz, 1994; Scherer, Wallbott, & Summerfield, 1986).

Mood states differ on a number of dimensions, three of which have been meaningfully related to creative performance – hedonic tone, activation, and regulatory focus. The first two aspects have a long history in psychological analyses

and thus are discussed only briefly here. The third aspect (regulatory focus) has more recently been forwarded and, therefore, is introduced in more detail. We examine how each construct alone and in combination may relate to creativity.

Hedonic Tone, Activation, and Regulatory Focus

When thinking about mood states, its valence or hedonic tone most readily comes to mind. Indeed, some mood states are positive in tone (e.g., happy, cheerful, relaxed) and others are negative in tone (e.g., anger, anxiety, sadness). Interestingly, growing evidence from research on self-reported mood and neurophysiological research suggests that the affective space can be parsed using pleasure on the one hand and activation on the other (Barrett, 2006; Heller, 1993; Heller & Nitschke, 1997; Lang, Greenwald, Bradley, & Hamm, 1993; Mano, 1992, 1997; see J. Posner, Russell, & Peterson, 2005, for a review). Some mood states are positive in tone and deactivating (calm, relaxed), whereas others are positive in tone yet activating (happy, elated). Likewise, some mood states are negative in tone and deactivating (sad, depressed), whereas others are negative in tone and activating (anger, fear; see also Heller, 1993; Thayer, 1989). This applies to temporarily activated and experimentally manipulated mood states (Russell & Barrett, 1999; Watson, Wiese, Vaidya, & Tellegen, 1999), as well as to trait-related differences in mood (Filipowicz, 2006). For example, trait extraversion is often equated with positive affectivity (positive, activating), and trait neuroticism is frequently equated with negative affectivity (negative, activating; Cropanzano, Weiss, Hale, & Reb, 2003; Eysenck, 1993).

In addition to hedonic tone and activation, mood states may be distinguished in terms of their association with self-regulation. Regulatory focus theory (Higgins, 1997; Idson, Liberman, & Higgins, 2000) distinguishes between promotion focus and prevention focus to describe two self-regulatory or motivational systems that underlie approach-avoidance behavior and emotional sensitivities. Promotion focus and prevention focus originate from distinct survival needs and relate to different desired end states. Promotion focus originates from the survival need for nurturance; self-regulation is concerned with aspirations and accomplishments as desired end states and yields sensitivity to the presence or absence of positive outcomes, with behavioral approach as the natural strategy to goal attainment. Prevention focus, in contrast, originates from the survival need for security; it involves responsibilities and safety as desired end states and yields sensitivity to the

presence or absence of negative outcomes, with behavioral avoidance as the strategic means to goal attainment.

Higgins (2006) recently argued that “the value experience of different emotional states is not properly characterized simply in terms of pleasure versus pain and high versus low arousal. The value experience from high and low engagement strength, within promotion and within prevention, must be included if we are to appreciate fully the psychological quality of these different emotions” (p. 452; see also Cacioppo, Gardner, & Berntson, 1999; Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Higgins, 1997; Lang, Bradley, & Cuthbert, 1990; Watson et al., 1999). Accordingly, it has been argued that some mood states are linked to the (un)successful attainment of desired end states, with cheerfulness-related positive mood states (happy, upbeat, satisfied) being linked to successful attainment and dejection-related negative mood states (sadness, disappointment, discouragement, anger, frustration) being linked to unsuccessful attainment. These moods closely associate with a promotion focus in which self-regulation is focused on accomplishments and aspirations and action tendencies reflect an approach orientation (Carver, 2006; Higgins, 1997, 2001, 2006). In contrast, quiescence-related positive mood states (relaxed, calm, serene) are linked to successful avoidance and agitation-related negative mood states (fearful, tense, worried) are linked to unsuccessful avoidance of undesired end states. These moods closely associate with a prevention focus in which self-regulation is focused on responsibilities and safety, and action tendencies reflect an avoidance orientation (e.g., Brockner & Higgins, 2001; Carver, 2004).

The close association between mood states, on the one hand, and motivational orientation and regulatory focus, on the other hand, also corresponds to the specific brain regions that are involved. Happiness, joy, interest, and anger all show left frontal cortical activation (Depue & Iacono, 1989; Harmon-Jones & Sigelman, 2001; Murphy, Nimmo-Smith, & Lawrence, 2003; Wacker, Heldmann, & Stemmler, 2003), an area typically associated with approach motivation and promotion focus (Davidson & Irwin, 1999; Higgins, 2006). Sadness shows less left lateralized activation, which may reflect a reduction in approach motivation (Depue & Iacono, 1989; Henriques, Glowaki, & Davidson, 1994). Fear and disgust, in contrast, show right frontal cortical activation (Davidson et al., 1990; L. A. Schmidt & Trainor, 2001), an area typically associated with avoidance motivation and prevention focus (Davidson, 2000; Higgins, 1997). This suggests that across time and situations, individuals experience promotion focus with (un)successful

attainment of desired end states and prevention focus with (un)successful avoidance of undesired end states, and they come to associate specific mood states with a specific motivational orientation and regulatory focus (cf. Burke, Brief, George, Roberson, & Webster, 1989; Fishbach & Labroo, 2007; Gendolla, 2000; Gendolla & Brinkmann, 2005). For example, fear comes to be associated with the tendency to avoid and prevent (Davidson, Jackson, & Kalin, 2000; LeDoux, 1995), and happiness comes to be associated with the tendency to approach and promote (see also Fredrickson, 2001; Frijda, Kuipers, & ter Schure, 1989; Izard & Ackerman, 2000; Roseman et al., 1994).

Taken together, mood states can be differentiated in terms of their hedonic tone, the extent to which they arouse and activate, and the degree to which they associate with approach motivation and promotion focus or with avoidance motivation and prevention focus. Whereas these are not the only dimensions clustering mood states, these constructs, alone and in combination, are meaningfully related to creativity. This relationship with creative performance is further developed in the next sections.

Hedonic Tone and Creativity

Hedonic Tone. Different theoretical accounts suggest that positive mood facilitates creative problem-solving. According to the dopaminergic theory of positive affect (Ashby et al., 1999, 2002), increased dopamine levels in the brain mediate many of the cognitive effects of positive affect. In this view, creative problem solving is improved because dopamine release in the anterior cingulate cortex improves the selection of, or the switching among, alternative cognitive sets. Furthermore, Isen and colleagues (Isen, 2000b; Isen & Daubman, 1984; Isen, Daubman, & Nowicki, 1987) suggested that compared with negative and neutral material, positive material is more extensively connected and better integrated in memory. In turn, this promotes spreading activation and increases the likelihood of making remote associations conducive to creative thought.

In addition, it has been argued that moods have a signaling function (Forgas, 1995; Schwarz & Bless, 1991).³ Positive moods signal a satisfactory and safe state of affairs, suggesting to individuals in a positive mood that processing requirements

³ Although differences exist with regards to the theoretical interpretations of mood effects on general cognitive processes, it is beyond the current scope to discuss them in depth. For a thorough discussion of both similarities and disagreements, we refer to reviews and discussions published elsewhere (e.g., Bless, 2001; Clore, Schwarz, & Conway, 1994; Forgas, 1995; L. L. Martin & Stoner, 1996; vs. Isen, 2000; Staw & Barsade, 1993).

are relaxed, which promotes the use of simplifying heuristics and “loose” processing (Fiedler, 2000) as well as the willingness to explore novel procedures and alternatives (Fiedler, 1988; Russ, 1993; for evidence see, e.g., Bless, Bohner, Schwarz, & Strack, 1990; Bodenhausen, Kramer, & Süsner, 1994; Mackie & Worth, 1989; Ruder & Bless, 2003). In contrast, negative moods signal that the state of affairs is problematic, which requires a careful assessment of the environment (Ambady & Gray, 2002; Fiedler, 1988; Schwarz & Bless, 1991). Research indeed shows that negative moods promote a systematic and detailed information-processing style focused on concrete external information (e.g., Forgas, 2002, 2007; Schwarz, 1990; Soldat & Sinclair, 2001).

Quite consistent with these theoretical perspectives, positive mood states have been shown to increase cognitive flexibility. For example, in their classic study, Isen and Daubman (1984) induced (or did not, in the control condition) a state of mild happiness and then asked participants to complete Rosch’s (1975) category inclusion task. In this task, participants were asked to rate how prototypical several exemplars (e.g., bus, camel) were for a particular category (e.g., vehicle). Higher ratings for the weak exemplar (camel) indicate broad cognitive categories, which are conducive to cognitive flexibility (Amabile, 1983; Eysenck, 1993). Isen and Daubman showed that compared with the control condition, happy participants had higher prototypicality ratings, that is, had broader and more inclusive cognitive categories (see also Isen, Niedenthal, & Cantor, 1992; Mikulincer & Sheffi, 2000; Murray et al., 1990). Other work showed that positive affect, as compared with negative and neutral affect, promoted cognitive flexibility and reduced perseverance (Goschke, 2006) and led to more unusual word associations (Isen, Johnson, Mertz, & Robinson, 1985), better performance on creative insight tasks (Greene & Noice, 1988; Isen et al., 1987; see also Estrada, Isen, & Young, 1994), and higher supervisor ratings of employees’ creativity (Madjar, Oldham, & Pratt, 2002).

From these ideas and research findings, it follows that mood states with positive hedonic tone (e.g., happiness, relaxed) promote creative performance to a greater extent than mood states with a negative hedonic tone (e.g., fear, sadness) or neutral-mood control conditions because positive hedonic tone increases cognitive flexibility and inclusiveness. We refer to this as the *hedonic tone hypothesis*: People in positive mood states show greater performance, first of all, on creativity measures that directly or indirectly assess cognitive flexibility (e.g., flexibility, insight or

eureka tasks), but probably also on originality, fluency, and overall creativity-composite measures.⁴

Mood as Input. Interrelated accounts, such as the mood as input and the affect as information models, suggest that task set may serve as a critical moderator of the possible effects of hedonic tone. The mood as input model (L. L. Martin, 2001; L. L. Martin & Stoner, 1996; Schwarz & Clore, 1983, 1996) ascribes an informational function to moods and posits that their motivational implications vary as a function of the situation. The problem signal elicited by negative moods motivates one to seek out and solve problems or to invest more effort in order to meet performance standards. In corresponding fashion, “the safety signal elicited by positive affective states should motivate those in such states to take advantage of the presumed safety by seeking stimulation and pursuing incentives, activities that would be ill advised under less benign circumstances” (Friedman, Förster, & Denzler, 2007, p. 143). By implication, positive, relative to negative, moods should bolster creative performance on tasks viewed as “fun” and “silly” and in situations in which the enjoyment of a task is being emphasized. Negative, relative to positive, moods, in contrast, should enhance effort on tasks viewed as “serious” and “important” and in contexts in which the focus is on meeting performance standards. Indeed, Friedman et al. (2007) showed that positive, relative to negative, moods enhanced creativity on tasks construed as fun and silly, whereas negative, relative to positive, moods bolstered creative performance on tasks construed as serious and important. Although in several cases, findings were not significant at the conventional level, the overall pattern across experiments was consistent with the idea that if a person’s mood is congruent with the task framing, more energy and time is put into the task, with enhanced creative performance as a result (L. L. Martin et al., 1993). Whereas participants in a negative mood benefit from a task set in which the task is framed as serious and performance standards and extrinsic rewards are emphasized, those in a positive mood benefit from a task set in which the task is framed as funny and in which enjoyment and intrinsic rewards are emphasized.

Taken together, the literature suggests a hedonic tone hypothesis in which mood states with positive tone trigger more creativity than neutral or negative mood states (Lyubomirsky et al., 2005; Murray et al., 1990). The mood as input

⁴ In meta-analytic terms, the hedonic tone hypothesis is about the positive–neutral, and the positive–negative mood contrasts. It makes no straightforward predictions about the neutral–negative mood contrast, something we therefore examine in more exploratory fashion.

model (L. L. Martin & Stoner, 1996) further suggests this hedonic tone hypothesis to be true when task set is positive (i.e., framed as fun and enjoyable, with intrinsic rewards being emphasized) and the reverse to be the case when task set is negative (i.e., framed as serious and important, with performance and extrinsic rewards being emphasized).

Activation and Creativity

That mood-related activation associates with creative performance is consistent with work on threat-rigidity (Staw, Sandelands, & Dutton, 1981) and the stress-performance linkage (Berridge & Waterhouse, 2003; Broadbent, 1972; Yerkes & Dodson, 1908). In essence, the idea is that an individual's capacity for complex thinking is altered in a curvilinear fashion as arousal and activation increases. Low levels of arousal lead to inactivity and disengagement, neglect of information, and low cognitive and motor performance. Extremely high levels of arousal reduce the capacity to perceive, process, and evaluate information and are thought to increase the likelihood of the dominant response rather than an innovative response (Berlyne, 1967; Easterbrook, 1959). However, at moderate levels of arousal, individuals are activated to seek and integrate information and to consider multiple alternatives. In short, moving from low to moderate levels of arousal and activation should improve cognitive processes, lead to broader and more inclusive cognitive categories, and promote cognitive flexibility (De Dreu et al., 2008). In addition, moving from low to moderate levels of activation increases cognitive persistence and perseverance (Brehm, 1999; Carver, 2004), which may also result in more creative ideas, insights, or problem solutions (Amabile, 1983; Friedman et al., 2007; Simonton, 1997).

That mood-related activation fosters creativity also follows from work showing that activation and arousal are associated with the release of dopamine and noradrenalin. These neurotransmitters enhance working memory capacity and the ability to comprehend, think, and plan (Baddeley, 2000; Flaherty, 2005; Goldman-Rakic, 1996; Usher, Cohen, Servan Schreiber, Rajkowski, & Aston Jones, 1999). Intermediate levels of dopamine are associated with improved working memory performance (Floresco & Phillips, 2001; Kimberg, D'Esposito, & Farah, 1997), increased maintenance of task-relevant information (Colzato, Van Wouwe, & Hommel, 2007), and better switching between tasks (Dreisbach & Goschke, 2004). Likewise, intermediate levels of noradrenalin enhance prefrontal cortex control of behavior, (short-term) working memory (Robbins, 1984; Usher et al., 1999), and

sustained selective attention on task-relevant information (Chamberlain, Muller, Blackwell, Robbins, & Sahakian, 2006).

All in all, these distinct literatures suggest that activating rather than deactivating mood states come together with greater motivation, higher levels of dopamine and noradrenalin, and enhanced working memory capacity. These, in turn, should facilitate cognitive flexibility, abstract thinking, processing speed, and access to long-term memory (Baddeley, 2000; Damasio, 2001; Dietrich, 2004). In other words, activating, rather than deactivating, moods facilitate cognitive flexibility and restructuring as well as more deliberate, analytical, and focused processing and combining of information. Indeed, activating moods produce more creativity than do deactivating moods (De Dreu et al., 2008), and affect intensity, measured with both negative and positive high-arousing terms, relates to higher levels of creativity in children (Russ & Grossman-McKee, 1990) as well as employees (George & Zhou, 2007). Thus, these works suggest the *activation hypothesis*, whereby activating mood states lead to more creative performance than do deactivating mood states.

Regulatory Focus and Creativity

Regulatory focus. Initial evidence that regulatory focus is related to creative performance was provided by Friedman and Förster (2001). In their study, participants received, on paper, a cartoon mouse trapped in a maze and were instructed to find a way out of the maze. In the promotion focus condition, a piece of Swiss cheese (gain) was lying outside the maze; in the prevention focus condition, an owl (threat) was depicted as hovering above the maze. The participants then engaged in several tasks designed to measure creativity. They found that promotion focus, compared with prevention focus, bolstered memory search for new responses, and promoted creative insight and divergent thinking. The relationship between regulatory focus and creativity received additional support by Friedman and Förster (2000, 2002) in a series of experiments on the influence of approach-avoidance motivation. Relative to avoidance motivation, approach motivation promoted creative insight and divergent thinking.

That promotion states produce more creativity than prevention states is commonly explained by arguing that promotion states engender a broad and global attentional scope and facilitate conceptual access to mental representations with lower a priori accessibility. Prevention states, in contrast, engender a narrow attentional scope, a focus on local perceptual details, and a “choking off” of

conceptual access to mental representations with lower a priori accessibility (Derryberry & Tucker, 1994; Förster et al., 2006; Förster & Higgins, 2005; Friedman & Förster, 2005a). Because creative insight and ideation benefit from restructuring of problem information and access to remotely associated cognitive material (Martindale, 1995; Mednick, 1962; S. M. Smith & Blankenship, 1991), these creative processes would be expected to benefit from a broader scope of attention at both the perceptual and conceptual levels (Förster et al., 2004; Rowe, Hirsh, & Anderson, 2007; Schooler, 2002). Mood states that associate with a promotion focus (anger, sadness, happiness, joy) would be expected to engender such an expanded attentional scope and thereby facilitate creative performance, whereas mood states that associate with a prevention focus (fear, relaxed, calm) would be expected to produce a more constricted scope of attention and thus to impede creativity.

Activation. Recently, Friedman and Förster (2008) proposed that the mood-creativity relationship is best understood in terms of the interaction between level of activation and a mood state's regulatory focus. In essence, effects on creativity are expected for activating moods that stimulate and engage and not for deactivating moods that lead to inaction and disengagement (Higgins, 2006). Thus, people in a sad mood are promotion focused but do not produce higher levels of creativity because they lack the approach motivation and behavioral tendencies (Frijda, 1986; Henriques et al., 1994). Similarly, people in a relaxed and calm state are prevention focused but do not produce lower levels of creativity because their engagement and avoidance tendencies are reduced (Fredrickson, Mancuso, Branigan, & Tugade, 2000; Frijda, 1986).

Conversely, the effects are expected for the activating and engaging moods. Thus, in line with Easterbrook (1959) and Derryberry and Tucker (1994), Friedman and Förster (2008) postulated that activating prevention focused states, such as anxiety (i.e., tense arousal), are associated with local processing and a narrowed focus of attention, thereby impeding creative performance. Indeed, fear and anxiety lead to narrow cognitive categories (Mikulincer et al., 1990a), lowered ability to shift attention (Derryberry & Reed, 1998), and reduced cognitive flexibility (e.g., Carnevale & Probst, 1998). Alternatively, activating promotion-focused states, such as happiness and joy (i.e., elated arousal), broaden the focus of attention, leading to increased responsiveness to peripheral cues on the perceptual level and increased activation of relatively inaccessible mental representations on the conceptual level, making the generation of novel alternatives more likely (cf. Fredrickson, 2001; Isen,

1999). Indeed, happiness engenders a perceptual focus on global form as opposed to local details (Fredrickson & Branigan, 2005; Gasper, 2004b; Gasper & Clore, 2002).

Taken together, the *regulatory focus hypothesis* posits that the interaction between a mood state's level of activation and its associated regulatory focus predicts creativity: Activating moods that are promotion focused (e.g., joy, anger) produce more creativity than mood-neutral controls, whereas activating moods that are prevention focused (e.g., fear) impede creativity compared with mood-neutral controls; deactivating promotion focused moods (e.g., sadness) and deactivating prevention focused moods (e.g., relaxed) are expected to have little effect on creativity.

The Present Study: Overview and Hypotheses

Whereas past work has focused on either the positive mood–neutral baseline contrast or the positive mood–negative mood contrast, neither a meta-analytic review of the negative mood–neutral baseline contrast nor a comparison of these three contrasts has been provided. Accordingly, our first goal was to provide a quantified insight into the strength and direction of mood effects on creative performance and to examine whether mood states influence various facets of creativity in qualitatively different ways.

Another central aim of the present meta-analysis was to test three sets of more or less contrasting predictions. To determine to what extent, when, and why positive and negative moods relate to creative performance, we performed a meta-analysis in which we examined effects of mood states (both induced and measured) in terms of hedonic tone, level of activation, and regulatory focus. The dopaminergic theory of positive affect (Ashby et al., 1999), and related accounts, pointed to the *hedonic tone hypothesis*, in which positive mood states are associated with greater cognitive flexibility and originality in comparison with mood-neutral control states as well as negative mood states. The mood as input account by L. L. Martin and Stoner (1996) suggested that this general idea is valid when tasks are framed as enjoyable and intrinsically rewarding and might reverse when tasks are framed as serious and extrinsically rewarding.

The stress-performance literatures suggested the *activation hypothesis*, in which (positive as well as negative) activating mood states are associated with creativity to a greater extent than (positive and negative) deactivating mood states and mood-neutral control states. Finally, on the basis of recent extensions of

regulatory focus theory (e.g., Friedman & Förster, 2008; Higgins, 2006), we advanced the *regulatory focus hypothesis*, in which activating moods that are promotion focused (e.g., joy, anger) produce more creativity than mood-neutral controls and activating moods that are prevention focused (e.g., fear) produce less creativity than mood-neutral controls.

Table 2.1

Moods States in Terms of Hedonic Tone, Level of Activation, and Regulatory Focus

Hedonic Tone							
Positive				Negative			
Deactivating		Activating		Deactivating		Activating	
Prevention focused	Promotion focused	Prevention focused	Promotion focused	Prevention focused	Promotion focused	Prevention focused	Promotion focused
Calm			Happy		Sad	Uneasy	Angry
Serene			Upbeat		Discouraged	Tense	Frustrated
Relaxed			Elated		Disappointed	Fear	
						Disgust	

Table 2.2

Predictions of the Relationship of Fear, Sadness, Relaxed state, and Happiness With Creative Performance

Mood	Hedonic Tone	Activation Level	Regulatory Focus
Fear	0	+	-
Sadness	0	0	0
Happiness	+	+	+
Relaxed state	+	0	0
Happiness-Sadness	+	+	+

Note. Symbols represent the following effects: - = negative; 0 = no; + = positive.

To test the three predictions, we first classified moods in terms of hedonic tone, level of activation, and regulatory focus (see Table 2.1), and we then compared the impact of specific mood states (fear, happiness, sadness, and relaxed state) against a neutral baseline and compared sadness with happiness. As can be seen in Table 2.2, the hedonic tone hypothesis suggests that, in comparison with a mood-neutral control condition, all positive moods (relaxed state, happiness) will promote

creativity.⁵ Furthermore, happiness is expected to engender more creativity than sadness. The hedonic tone hypothesis makes no straightforward predictions about the neutral–negative mood contrast. The activation hypothesis suggests that all activating moods (fear, happiness) will promote creativity and that deactivating moods (sadness, relaxed state) will not. Happiness (activating) is also expected to engender more creativity than sadness (deactivating). Finally, the regulatory focus hypothesis suggests that activating promotion focused moods (e.g., happiness) will enhance creativity, whereas activating prevention focused moods (e.g., fear) will impede creativity. Thus, fear is expected to diminish creativity, and happiness is expected to stimulate creativity. Finally, the regulatory focus hypothesis predicts that happiness (promotion focused and activating) will produce more creativity than sadness (promotion focused but deactivating).

Moderators

Several moderators were already discussed, such as aspects of creativity and task framing. We further explored the moderating influence of time available for the creativity task (limited vs. unlimited), thus recognizing that creative performance may be achieved through fast and global processing as well as through more effortful and analytical processing (cf. Kaufmann & Vosburg, 2002). To enable conclusions about causality and generality, we incorporated study design (experimental vs. correlational), study population (child participant, undergraduate students, or general adult population), and induction procedure as possible moderators. As to the latter, researchers on the mood-creativity relationship exert a broad range of induction procedures to get participants in the intended mood (Brenner, 2000; Gerrards-Hesse, Spies, & Hesse, 1994; M. Martin, 1990). Induction procedure has been found to influence emotional experience as well as brain activation (Christie & Friedman, 2004; Phan, Wager, Taylor, & Liberzon, 2004; Stemmler, 1989). Moreover, some induction procedures allow for better differentiation among mood states than others. Whereas film clips are shown to generate happiness, sadness, anger, fear, disgust, and surprise, as well as neutral mood states (Rottenberg, Ray, & Gross, 2007), the Velten procedure, which consists of three lists of 60 self-referent affective statements that participants are asked to read aloud, evokes only happiness, sadness, and a mood-neutral control state

⁵ Table 2.2 presents contrasts only for those moods that could be tested meta-analytically (i.e., more than one relevant study was found). For other moods, such as anger or disgust, the three theories make predictions as well but these could not be tested meta-analytically and are thus not presented in this Table.

(Velten, 1968). To establish the influence of mood induction procedures, we classified procedures into the following categories: (a) imagery techniques, (b) emotion-inducing materials, (c) emotional treatment, and (d) a combination of induction procedures (Brenner, 2000; Gerrards-Hesse et al., 1994). Finally, for the experimental studies, we explored the moderating influence of manipulation check features (strength of manipulation, report of manipulation checks).

METHOD

Literature Search

The meta-analysis covers the period that begins with publications of the first experimental work on the mood-creativity relationship (Isen & Daubman, 1984; Strauss, Hadar, Shavit, & Itskowitz, 1981; Ziv, 1983) and ends with a call for (un)published papers about this topic in spring 2006. A literature search was conducted with the online databases PsycINFO, Web of Science, and Dissertation Abstracts International. Keyword terms used to capture mood were *mood*, *emotion*, *affect*, and several specific mood states (e.g., *anger*, *happiness*, *anxiety*, *sadness*). Creativity was captured with the following terms: *creative*, *creativity*, *divergent thinking*, *originality*, *(ideational) fluency*, *flexibility* (or *flexible thinking*), *insight*, and *remote associations*. Keyword terms from both categories were entered into a single search to retrieve relevant studies. In addition, we conducted a backward search of the reference section of each obtained article as well as that of review articles (e.g., Ashby et al., 1999; Kaufmann, 2003) and searched for references citing the following seminal articles: Greene and Noice (1988), Isen and Daubman (1984), Isen et al. (1987), Isen et al. (1985), Kaufmann and Vosburg (1997), and Murray et al. (1990). In spring 2006, we also contacted authors who had investigated the mood-creativity relationship in the past to collect current and unpublished research and placed a call for unpublished empirical studies on the Websites of the European Association of Experimental Social Psychology and the Society of Personality and Social Psychology. Finally, we examined conference proceedings of the Academy of Management, the European Association of Experimental Social Psychology, the International Society for Research on Emotions, the Society for Industrial and Organizational Psychology, and the Society for Personality and Social Psychology for meetings held in the period from 2004 to 2006.

Rules for Inclusion in the Meta-Analysis

In accordance with the recommendations for research synthesis (Hall, Tickle-Degnen, Rosenthal, & Mosteller, 1994; Matt & Cook, 1994), we determined the breadth of conceptual territory of our meta-analysis. Studies were included in the meta-analysis if they (a) included a manipulation of mood states, a measure of general affect or affective states (anxiety, worries, feelings of depression), or both; (b) included an objective (i.e., not self-report) measure of creativity or divergent thinking; (c) included a sample from the general, non-clinical population; and (d) provided the necessary statistical information to compute effect sizes.

Description of Included and Excluded Work

We determined a priori that studies should directly measure or induce specific mood states or general affect. Most experimental studies on the mood-creativity relationship adopted commonly applied induction procedures (e.g., evocative film clips, self-generated stories about an emotional event, or an unexpected small gift; for reviews see Brenner, 2000; Gerrards-Hesse et al., 1994; M. Martin, 1990). Some studies, however, adopted relatively uncommon induction procedures. For example, in their study on creativity, K. L. Smith, Michael, and Hocevar (1990) instructed participants in the anxiety condition to do their absolute best on several fluency tasks and additionally stressed that they had to work under strict time pressure. Because similar instructions are typically used to provide performance standards (cf. Erez & Isen, 2002), and manipulation checks for anxiety were not reported, this study was excluded. Also excluded were studies that manipulated variables typically associated with mood changes, such as noise (Kasof, 1997) and reward (Eisenberger & Rhoades, 2001). This type of work was deemed unsuitable for present purposes because it did not manipulate or assess mood. In total, five studies were excluded for the reasons stated above.

The adopted mood questionnaires in the mood-creativity literature were aimed at general positive or negative moods or at specific mood states. Sample questionnaires of general affect are the Positive and Negative Affect Schedule (PANAS) questionnaire (Watson, Clark, & Tellegen, 1988) and the Adjective Check List (Russell, 1979), on which respondents are asked to indicate to what extent they felt certain positive (e.g., happy, satisfied) and negative (e.g., sad, scared) states. Other questionnaires are directed toward specific mood states, such as state anxiety (State-Trait Anxiety Inventory [STAI]; Spielberger, 1968), enthusiasm, relaxation, fatigue, and nervousness (Job Affect Scale; Brief, Burke, George, Robinson, &

Webster, 1988). Some questionnaires tap into constructs that are related to mood states yet deemed unsuitable for present purposes. The Affect in Play Scale (Russ, Robins, & Christiano, 1999) measures intensity and variety of mood but is unspecific for hedonic tone or specific mood states. Furthermore, research on the relationship between job (dis)satisfaction and creativity (e.g., Zhou & George, 2001) was excluded, because (dis)satisfaction is an attitude toward the job (Judge, Thoresen, Bono, & Patton, 2001) and is not necessarily (strongly) correlated with mood states (e.g., Fortunato, 2004). In total, 4 studies were excluded for the reasons stated above.

We selected objective performance measures of creativity and, if these were unavailable, selected external (e.g., supervisor) ratings. Included measures of creativity were fluency, flexibility, originality, insight tasks, and creativity performance (see earlier section). Although (self-reported) attitude and interest inventories, personality inventories, or biographical inventories are commonly used as indicators of creativity (Hocevar & Bachelor, 1989), we considered these to be indirect and subjective indicators of creativity that do not necessarily reflect actual creative performance (cf. Nemeth & Ormiston, 2007), and thus we did not include 3 studies in the meta-analysis that used these measures (e.g., Shapiro & Weisberg, 1999).⁶ Likewise, we excluded 3 studies that used tests that are more commonly associated with intelligence or executive performance, such as syllogism performance tasks and the Tower of London task (e.g., Melton, 1995) and 8 studies that did not directly tap into creativity but only indirectly related to constructs, such as variety seeking (Kahn & Isen, 1993), complex decision-making (Staw & Barsade, 1993), negotiated agreement (Carnevale & Isen, 1986), or global versus local orientations (e.g., Fredrickson & Branigan, 2005). Finally, because of our interest in psychological processes in non-clinical samples, we excluded 2 research reports that linked mood disorders to creativity and that involved clinical participants (e.g., Weisberg, 1994), and we excluded 5 articles that lacked the necessary statistical information to compute effect sizes.

In total, we obtained 66 reports, of which 12 were unpublished papers or dissertations. From these 66 papers, we examined $k = 102$ independent samples that met the inclusion criteria for the review. A summary of studies in the meta-analysis is provided in the Supplemental Materials (Appendixes A, B, and C, available online).

⁶ Self-reports of creativity were not included because these measures may be more strongly affected by social desirability and self-enhancement tendencies. Furthermore, in many cases common-source variance represent a validity threat. Note that excluding self-report measures renders the current assessment somewhat conservative.

Coded Variables

Each study was independently coded by all three authors for information required to estimate effect sizes, study design (experimental design vs. correlational design), population type (child participant, undergraduate students, or general adult population), component of creativity, type of induction procedure, manipulation check features (e.g., strength of manipulation, report of manipulation checks), and time per task. Moreover, for the positive-negative contrast, we also coded for task framing. Further, we established whether a particular mood was considered as activating or deactivating and as prevention focused versus promotion focused. Inter-rater reliabilities were good to excellent (Cohen's $K > .80$) and differences were settled through discussion.

Component of creativity. We coded component of creativity into eureka/insight tasks, flexibility, fluency, originality, and composite measure of creative performance. Studies or subsets of studies that included data on the number of unique, nonredundant ideas or problem solutions that are generated were coded in the fluency category. Studies or subsets of studies that included the number of distinct semantic categories that participants used, scores on the category inclusion task, and success rates on the ability to switch approaches were coded in the flexibility category. Those studies or subsets of studies that included measures of originality or uncommonness of generated ideas were coded in an originality category. Insight or eureka tasks have only one known solution and typically need restructuring of the presented material to solve the problem. Duncker's (1945) candle problem, the Remote Associates Test (Mednick, 1962), analogy tests, and anagram tasks were coded in this category. Finally, creativity measures that were derived from a proximal other's evaluative impressions and do not fall into the flexibility, fluency, originality or insight categories were coded in a composite measure of creativity. This category included supervisor ratings of the creativity of their employees along with ratings of poems, stories, collages, and buildings.

Induction procedure. On the basis of classifications by Gerrards-Hesse et al. (1994) and Brenner (2000), we coded mood induction procedure into the following categories: (a) imagery techniques, (b) emotion-inducing materials, (c) emotional treatment, or (d) a combination of induction procedures. The general principle for imagery techniques is that the participants are instructed to get into an intended

mood state by imagination. For example, self-generated imagery tasks instruct participants to imagine and re-experience personal situations or events to induce the intended mood state (e.g., Strack, Schwarz, & Gschneidinger, 1985). Another example is the abovereferenced Velten technique (Velten, 1968). With emotion-inducing materials, participants are presented with emotional stimuli without the explicit instruction to the participants to experience the suggested mood state. Examples are unexpected gifts, evocative film clips, music excerpts, and emotional stories. In emotional treatment procedures, actual or perceived success or failure of task performance is manipulated, so that participants experience either positive moods or negative moods. Another example involves positive or negative behavior of the experimenter or confederates toward the participants. Finally, to increase their effectiveness, some authors have combined different mood induction procedures. For example, Kavanagh (1987) combined a recollection of a past emotional experience with music excerpts to induce a sad or happy mood.

Manipulation check features. For the experimental studies, we coded for two manipulation check features. First, we distinguished between studies that reported mood manipulation checks and studies that did not or were unspecific in their report of manipulation checks. Second, for those studies that did report manipulation checks, we calculated the strength of the mood manipulation on the basis of the available information. Manipulation strength was included as a continuous measure in a meta-regression.

Time on task. For the studies using divergent thinking and brainstorming tasks that reported the amount of time that participants could spend on generating ideas, we coded for task time. Some studies required participants to generate ideas about possible ways to use only one object (e.g., a brick), whereas other studies required participants to generate ideas about ways to use several objects or categories (e.g., a brick, a can, an umbrella). Because we regarded each object or category as a separate creativity task, we decided to code for the amount of time participants were given to generate ideas for each object or category. Task time was included as a continuous measure in a meta-regression. The studies described above all involved a time limit and were coded as such. Other studies gave participants unlimited time to generate ideas and were coded as unlimited.

Task framing. We coded studies or subsets of studies as being serious and involving performance standards versus as being silly and fun or involving enjoyment standards. An example of a performance standard is “Stop when you think you’ve done enough.” An example of an enjoyment standard is “Stop when you no longer feel like continuing.”

Level of activation. We used the circumplex model of affect by Barrett and Russell (1998) as guidelines to code a mood state for each study as activating or deactivating (see also Table 2.1). Receipt of an unexpected gift, excerpts of a comedy film, and the enthusiasm scale (strong, elated, and excited) clearly indicate a positive activating mood state (see e.g., Isen & Daubman, 1984) whereas the relaxation scale (calm, at rest, and relaxed) includes clear markers of a positive deactivating mood (see Madjar & Oldham, 2002). Similarly, feelings evoked by violent film clips (see T. A. Anderson & Pratarelli, 1999) and state anxiety, as measured with the STAI (see Carlsson et al., 2000), are examples of a negative activating mood; depressed feelings resulting from listening to depressing music (see Adaman & Blaney, 1995) or as assessed with the Center for Epidemiologic Studies—Depression Scale (CES-D; see Verhaeghen et al., 2005) are marked as unpleasant and deactivating in the circumplex model of affect. Mood states were coded as diffuse if the mood scale consisted of both activating (e.g., happy, joyful, jittery, tensed) and deactivating (e.g., contented, satisfied, depressed, bored) mood markers or if the treatment material was ambiguous. A documentary film depicting Nazi concentration camps (Isen et al., 1987) may evoke sadness, anger, or disgust. Similarly, it is unclear whether relaxed or elated moods are produced when participants are asked to imagine an event from their past that put them in a good mood (Grawitch, Munz, & Kramer, 2003) and when participants are primed with affectively positive words (Isen et al., 1985).

Regulatory focus. The authors determined regulatory focus of each mood state, following suggestions by Carver (2004), Crowe and Higgins (1997), and Amodio, Shah, Sigelman, Brazy, and Harmon Jones (2004). Cheerfulness related moods (happy, upbeat, satisfied), and dejection related moods (sad, disappointed, discouraged, angry) were coded as promotion focused. Agitation related moods (uneasy, fearful, tense, worried) and quiescence related moods (relaxed, calm, serene) were coded as prevention focused. Mood states were coded as diffuse if the mood scale consisted of both promotion and prevention focused mood markers or if the treatment material was ambiguous. For example, both prevention and

promotion focused moods are produced if participants are asked to imagine an event from their past that put them in a troubling (prevention) or sad (promotion) mood (Friedman et al., 2007). Further, the Negative Affect Scale (Watson et al., 1988) consists of both prevention focused (afraid, tense) and promotion focused moods (hostile, irritable). Similarly, violent film clips might evoke agitation and disgust (prevention) but also hostility and anger (promotion; see T. A. Anderson & Pratarelli, 1999).

Computation and Analysis of Effect Sizes

The Hedges and Olkin (1985) approach was used to compute the effect size (r) on the basis of a random effects model for the positive-neutral contrast, the negative-neutral contrast, and the positive-negative contrast (Rosenthal, 1994).⁷ The correlations were coded such that positive signs indicate better creative performance when there are higher levels of positive mood for the positive-neutral contrast and the positive-negative contrast, or when there are higher levels of negative moods for the negative-neutral contrast. Moderator analyses were conducted to determine whether component of creativity, level of activation, regulatory focus, and other possible moderating variables were related to the heterogeneity of effect sizes (Hedges & Olkin, 1985). We computed effect sizes and conducted the moderator-analyses with the aid of a computer program (Biostat Version 2, 2007; Comprehensive Meta-Analysis). These computations were based on reports of means and standard deviations, zero-order correlations, raw proportions, t tests, and F ratios.

We relied on reported means and standard deviations to compute an effect size. In several studies on the mood-creativity relationship, variables other than mood were also manipulated, and data were presented separately for subgroups. We then computed overall means and standard deviations (weighted for number of

⁷ One may wonder whether results may be due to the specific meta-analytic method we used. We believe this is not the case. First, there are some differences between the Hedges and Olkin method used here and other commonly applied methods for meta-analysis, such as the Hunter and Schmidt (1990) approach and the one developed by Rosenthal (1991). Initial comparisons of these various approaches revealed some problems with the Hunter and Schmidt method and superior results for the Hedges and Olkin, and Rosenthal methods (Johnson, Mullen, & Salas, 1995). However, recent comparisons suggest these initial discrepancies emerge under very specific circumstances and it is safe to assume current results generalize across these three different meta-analytic approaches (F. L. Schmidt & Hunter, 1999). Second, rather than using a fixed-effects model, we applied the more conservative and recommended random-effects model (National Research Council, 1992).

participants per condition) and subsequently calculated an effect size. When means and standard deviations were missing, we used reported t tests and F ratios to compute Hedges's g , which was subsequently converted into effect sizes (r). We used zero-order correlations between scores on mood questionnaires and creative performance so that for the positive-neutral contrast, positive correlations reflected positive moods associated with more creativity in comparison with neutral moods; for the negative-neutral contrast, positive correlations reflected negative moods associated with more creativity in comparison with neutral moods; and for the positive-negative contrast, positive correlations reflected positive moods associated with more creativity in comparison with negative moods.

We calculated the within-class goodness-of-fit statistic Q_w (which is approximately chi-square distributed, with $k - 1$ degrees of freedom, where k is the number of effect sizes), which tests for homogeneity in the true correlations across studies. A low percentage of variance explained and a significant Q_w statistic indicate the likelihood of moderators that explain variability in the correlations across studies. Moderator analyses were computed with the categorical model test (Hedges & Olkin, 1985), which results in the between-class goodness-of-fit statistic Q_b , with $p - 1$ degrees of freedom, where p is the number of classes. Analogous to analysis of variance (ANOVA), Q_b is similar to a main effect in an ANOVA.

Because we examined several possible moderating variables (e.g., level of activation, regulatory focus, mood induction procedure, component of creativity), many studies yielded more than one relevant effect size. However, using more than one effect size per sample violates the independence assumptions of meta-analysis (Cooper & Hedges, 1994). Thus, if possible, we created a data set that included only one effect size per sample. Divergent thinking tests posed a problem, because they are typically scored for fluency, originality, and flexibility, exactly the distinct components of creativity we were interested in considering as a possible moderator. Hence, we allowed more than one effect size per study for moderator analyses for the component of creativity. For the analyses in which we looked for overall effect sizes for each contrast or moderating effects of level of activation and regulatory focus, we used the mean effect size for creative performance for a sample.

RESULTS

Overview of Analyses

We report the results of the meta-analysis of the mood-creativity relationship in two sections. In the descriptive section, we compared the impact of moods on

creativity in (a) a contrast in which positive moods were compared with mood-neutral control conditions, (b) a contrast in which negative moods were compared with mood-neutral control conditions, and (c) a contrast in which positive moods were compared with negative moods. For each contrast, we computed an overall effect size for creative performance and investigated whether the following were reliable moderator variables: study design (experimental vs. correlational design), population type (child participants, undergraduate students, or general adult population), type of induction procedure (emotion-inducing material, imagery techniques, emotional treatment, or a combination of procedures), manipulation check features (strength of manipulation, report of manipulation checks), component of creativity (creative performance, eureka/insight tasks, flexibility, fluency, and originality), and time limit (limited vs. unlimited time). Moreover, for each contrast, we meta-regressed creative performance on the amount of time participants received to complete the divergent thinking task. Finally, for the positive-negative contrast we tested the possibility that task framing (enjoyment framing vs. performance framing) moderated the effect. We end the descriptive section with a report of trim-and-fill procedures to test and adjust for publication bias.

In a subsequent section, we report on our evaluation of the hedonic tone, activation, and regulatory focus hypotheses, in which we compared the impact on creativity of specific mood states (fear, happiness, sadness, and relaxed state) relative to mood-neutral control conditions and of happiness relative to sadness. These mood states vary among each other in hedonic tone, level of activation, and regulatory focus (see Table 2.1), and allowed us to establish which theory best fit the data.

Overall Effects and Moderating Study Variables

Positive–Neutral Contrast

The literature search identified 44 articles comparing positive with neutral moods with a total of 63 independent studies covering a total of 5,165 participants (see Appendix A of the Supplemental Materials online).⁸ Of these 63 studies, 48 compared positive and neutral moods in an experimental design. The remaining 15 studies correlated scores on mood questionnaires with scores on creativity tests.

⁸ To enable a comparison between experimental studies and correlational studies we report effect sizes in r , rather than the Cohen's d index, which is more commonly used in experimental design. Using r also allows a direct comparison of the current findings to other meta-analyses in social psychology (Richard et al., 2003).

Because some studies contained multiple creativity measures, we were able to compute multiple effect sizes per study. We included 89 effect sizes differentiated for component of creativity. With effect sizes considered as outliers if they were larger than three standard deviations from the group mean, we found no outliers for the overall analysis.

Results revealed a small to moderate overall effect size, showing that positive mood states related to more creativity than did neutral mood states ($r = .15$, $k = 63$, 95% confidence interval [CI] = .10, .19). However, a large Q_w -value indicated that variance may be explained by moderator variables, $Q_w = 160.51$, $p < .01$. Population type (undergraduate students, child participants, or general adult population) did not moderate the effect for the positive-neutral contrast, $Q_b(2) = 2.91$, ns , nor did component of creativity, $Q_b(4) = 6.85$, ns (see Table 2.3). However, study design moderated the effects of positive moods, $Q_b(1) = 4.13$, $p < .05$. Although still significant, the effect size was smaller in questionnaire studies ($r = .08$, $k = 15$, 95% $CI = .00, .16$, $Q_w = 42.81$, $p < .01$) than in experimental studies ($r = .18$, $k = 48$, 95% $CI = .12, .24$, $Q_w = 109.60$, $p < .01$). At the least this effect shows that positive moods can cause more creativity than neutral moods.

For experimental studies, we meta-regressed creative performance on the strength of the mood manipulation, but the result was not significant, $p > .35$. In addition, creativity effects did not differ among studies that reported mood manipulation checks and those that did not, $Q_b(1) = .85$, $p > .35$. However, we did find that induction method (emotion-inducing material, imagery techniques, emotional treatment, or a combination) was a significant moderator, $Q_b(3) = 12.15$, $p < .01$. Results in Table 2.3 show that positive moods induced with emotion-inducing materials or imagery techniques produced more creativity than did mood-neutral control states but that positive treatment was related to lower creativity than neutral controls. It should be noted, however, that the latter result derives from a single study (Akinola & Mendes, 2007), and dropping this study indeed yielded a non-significant effect for induction method as moderator, $Q_b(2) = 1.17$, ns .

Focusing on divergent thinking tasks only, we found no moderating effect for time limit, $Q_b(1) = 1.81$, ns . However, for those divergent thinking tasks with fixed time limit, a meta-regression that was based on a method-of-moments mixed-effects model, showed that the estimated decrease in z -transformed effect size for creativity per minute increase was -0.03 ($SE = 0.02$, 95% $CI = -.06, -.00$, $p < .05$). The intercept was significant at $r = .29$ ($SE = 0.09$, 95% $CI = .11, .46$). Moreover, the originally significant Q_w of 37.95 ($p < .01$) decreased to a non-significant Q_w of 20.81 ($p > .07$).

Chapter 2 – Mood-Creativity Meta-Analysis

Table 2.3

Meta-Analysis of the Mood-Creativity Relationship for the Positive–Neutral Contrast

Variable	<i>k</i>	<i>N</i>	<i>r</i>	<i>CI</i>		<i>Q_w</i>
				Lower	Upper	
Overall	63	5,165	.15	.10	.19	160.51**
Trimmed results ^a			.10	.05	.15	221.80**
Moderators						
Study type ^b						
Correlational	15	2,307	.08	.00	.16	42.81**
Experimental	48	2,858	.18	.12	.24	109.60**
Induction procedure ^c						
Emotion-inducing material	24	1,225	.21	.12	.30	59.26**
Imagery techniques	19	1,232	.19	.11	.26	32.24*
Emotional treatment	1	55	-.28	-.50	-.01	
Combination	4	346	.11	-.05	.26	5.37
Population type						
Child participants	2	100	.38	.03	.65	2.34
Students	55	4,187	.14	.08	.19	147.55**
Adult population	6	878	.18	.12	.25	3.84
Creativity indicator						
Composite	14	1,538	.09	.00	.18	39.18**
Insight/eureka	19	1,073	.18	.07	.29	58.60**
Flexibility	18	1,657	.13	.06	.20	28.26*
Fluency	21	1,821	.17	.08	.25	54.81**
Originality	17	1,512	.27	.16	.38	62.87**
Time limitation						
Time limit	14	1,474	.14	.04	.23	37.95**
Unlimited	5	401	.25	.12	.36	6.43
Activation ^c						
Deactivating	3	750	.01	-.06	.08	.50
Activating	53	4,408	.17	.13	.22	108.69**
Diffuse	11	866	.03	-.12	.18	43.86**

Note. Neutral-Positive (0,1); *k* = number of samples; *CI* = 95% random effects confidence intervals; *Q_w* = heterogeneity statistic.

^aEleven studies were trimmed and filled. ^b*Q* for comparison between subcategories of moderator significant at *p* < .05. ^c*Q* for comparison between subcategories of moderator significant at *p* < .01.

* *p* < .05. ** *p* < .01.

Thus, as can be seen in Figure 2.1, the tendency for positive moods to promote divergent thinking more than neutral baselines became less and less pronounced as task time increased. We return to this finding in the General Discussion.

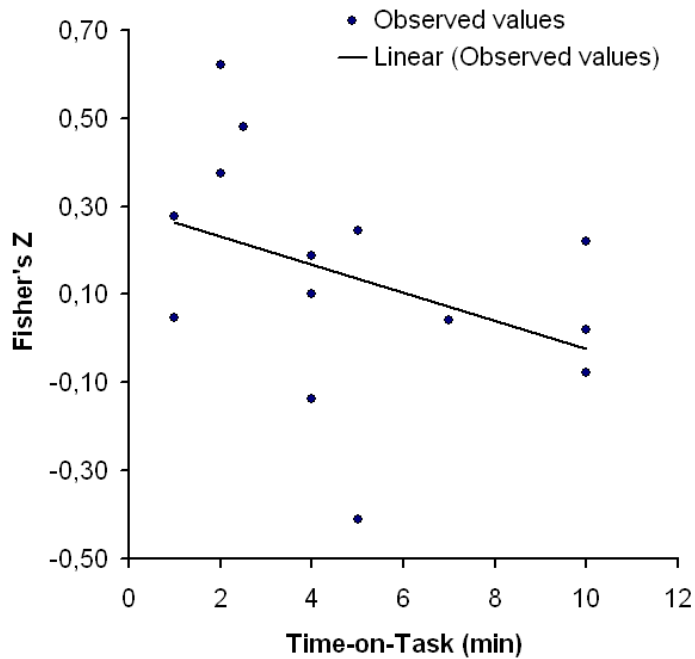


Figure 2.1. Divergent Thinking Performance as a Function of Time on Task for the Positive–Neutral Contrast

That positive mood states relate to more creativity than mood-neutral states is in line with the hedonic tone hypothesis. However, close inspection of the studies involved in the above analyses revealed that 79.10% compared happiness to a mood-neutral control condition. Happiness, as mentioned earlier, is a mood state that is positive in tone, activating, and promotion focused. A minority of 4.48% of the studies compared a calm, relaxed, and serene mood state (positive tone, deactivating, prevention focused) with a mood-neutral control condition, and 16.42% of the studies were coded as “diffuse” and could not be differentiated in terms of activation or regulatory focus. A moderator analysis differentiating between positive activating and promotion focused mood states (happy, elation, joy), positive diffuse mood states, and positive deactivating, prevention focused mood states (calm, serene) was significant, $Q_b(2) = 14.99, p < .01$. People in positive, activating and promotion focused moods were more creative than mood-neutral controls ($r = .17, k = 53, 95\% CI = .13, .22, Q_w = 108.69, p < .01$), but people in

positive deactivating and prevention focused, or positive diffuse mood states, were not more or less creative than mood-neutral controls ($r = .01$, $k = 3$, 95% $CI = -.06, .08$, $Q_w = .50$, ns , and $r = .03$, $k = 11$, 95% $CI = -.12, .18$, $Q_w = 43.86$, $p < .01$, respectively). These results were not moderated by study design (experimental vs. correlational), all $Q_{bs} < .95$, ns .

Taken together, the significant positive-neutral contrast discussed earlier may be due to positive tone in combination with high activation, promotion focus, or both. We return to this in the next section when we compare specific mood states and formally test the hedonic tone, activation, and regulatory focus hypotheses.

Negative–Neutral Contrast

The literature search identified 44 articles considering the role of negative moods in comparison with mood-neutral control conditions, yielding a total of 61 independent studies and a total of 4,435 participants (see Appendix B, available online). Of these 61 studies, 31 compared negative with neutral moods in an experimental design. The remaining 30 studies correlated scores on mood questionnaires with scores on creativity tests. Differentiated for component of creativity, we included 84 effect sizes. With effect sizes considered as outliers if they were larger than three standard deviations from the group mean, we found no outliers for the overall analysis.

Results revealed a non-significant and heterogeneous effect size, $r = -.03$, $k = 61$, 95% $CI = -.08, .01$, $Q_w = 126.09$, $p < .01$. Study population or component of creativity did not moderate the mood-creativity relationship, $Q_b(1) = .32$, ns , and $Q_b(4) = .59$, ns respectively (see also Table 2.4). However, including study design as moderator revealed a significant effect, $Q_b(1) = 5.24$, $p < .05$, showing that effect sizes were non-significant for experimental studies ($r = .03$, $k = 31$, 95% $CI = -.04, .10$, $Q_w = 54.23$, $p < .01$) and negative and significant for questionnaire studies ($r = -.08$, $k = 30$, 95% $CI = -.14, -.02$, $Q_w = 64.64$, $p < .01$). It thus appears that negative moods relate to less creativity but negative moods do not necessarily *cause* less creativity. For experimental work, the null-finding generalizes across different induction methods, $Q_b(3) = 3.27$, ns , the strength of the mood induction procedure ($p > .95$), and whether mood manipulation checks were reported, $Q_b(1) = 2.90$, $p > .08$. Finally, including time limitation for divergent thinking tasks as a moderator did not result in a significant effect, $Q_b(1) = 2.08$, ns (see Table 2.4) and the meta-regression analysis in which creativity was regressed on time per task also failed to reach significance ($p > .70$).

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Table 2.4
Meta-Analysis of the Mood-Creativity Relationship for the Negative-Neutral Contrast

Variable	<i>k</i>	<i>N</i>	<i>r</i>	<i>CI</i>		<i>Q_w</i>
				Lower	Upper	
Overall	61	4,435	-.03	-.08	.01	126.09**
Trimmed results ^a			-.03	-.07	.02	132.89**
Moderators						
Study type ^b						
Correlational	30	2,886	-.08	-.14	-.02	64.64**
Experimental	31	1,549	.03	-.04	.10	54.23**
Induction procedure						
Emotion-inducing material	12	544	.03	-.12	.18	31.13**
Imagery techniques	15	862	.05	-.02	.12	13.56
Emotional treatment	2	60	-.15	-.81	.69	4.76*
Combination	2	83	-.16	-.37	.06	.29
Population type						
Child participants	1	47	.02	-.27	.31	
Students	56	3,762	-.03	-.09	.02	124.76**
Adult population	4	626	-.05	-.13	.03	.75
Creativity indicator						
Composite	14	1,367	-.01	-.09	.07	24.57*
Insight/eureka	9	500	-.00	-.11	.11	11.18
Flexibility	25	1,768	-.04	-.13	.05	70.78**
Fluency	22	1,905	-.03	-.12	.05	53.19**
Originality	14	1,363	.00	-.09	.09	28.26**
Time limitation						
Time limit	17	1,683	-.06	-.15	.02	34.75**
Unlimited	4	262	.09	-.10	.28	6.53 [†]
Activation						
Deactivating	21	1,746	.02	-.05	.08	27.80
Activating	30	2,736	-.08	-.14	-.01	74.66**
Diffuse	16	934	.01	-.09	.11	31.75**

Note. Neutral-Negative (0,1); *k* = number of samples; *CI* = 95% random effects confidence intervals; *Q_w* = heterogeneity statistic.

^aTwo studies were trimmed and filled. ^b*Q* for comparison between subcategories of moderator significant at *p* < .05.

[†] *p* < .10. * *p* < .05. ** *p* < .01.

All in all, it can be concluded that only within correlational studies did negative moods relate to less creativity than mood-neutral controls. Further, the (lack of) effects generalized across population type, induction method, manipulation check features, and facet of creativity. However, the results also suggest that negative moods in general do not necessarily produce less creativity – we need to be cautious about the directionality of the relationship between negative moods and creative performance and return to this in the General Discussion.

As with the positive-neutral contrast, caution is needed regarding the underlying process. Close scrutiny of the included studies reveals that in the questionnaire sample, only 8.57% of the studies assessed sadness and 77.14% of the studies included fear and anxiety (negative, activating, and prevention focused) or another negative activating state; fear was not included in the experimental samples, and only 3 studies experimentally induced negative activating moods; the majority of the experimental studies (56.25%) involved sadness (negative, deactivating, and promotion focused). Thus, regulatory focus and level of activation covaried with study design.

A moderator analysis differentiating between activating negative moods (fear, anxiety, negative affect), deactivating negative moods (sadness, depressed state), and negative diffuse moods failed to reach significance, $Q_b(2) = 4.34, p = .11$. Nevertheless, people in a negative, activating mood were less creative than mood-neutral controls ($r = -.08, k = 30, 95\% CI = -.14, -.01, Q_w = 74.66, p < .01$), whereas people in a negative, deactivating mood were not more or less creative than mood-neutral controls ($r = .02, k = 21, 95\% CI = -.05, .08, Q_w = 27.80, ns$). Likewise, those in negative diffuse mood states were not more or less creative than mood-neutral controls ($r = .01, k = 16, 95\% CI = -.09, .11, Q_w = 31.75, p < .01$). These results run against the activation hypothesis that activating moods produce more creativity than deactivating moods, but the question remains as to whether regulatory focus plays a role. We return to this in the section where we report on formal testing of the hedonic tone, activation, and regulatory focus hypotheses.

Positive–Negative Contrast

The literature search identified 33 articles comparing negative and positive moods with a total of 52 independent studies and a total of 3,559 participants (see Appendix C of the Supplemental Materials online). Of these 52 studies, 50 compared

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Table 2.5

Meta-Analysis of the Mood-Creativity Relationship for the Positive–Negative Contrast

Variable	<i>k</i>	<i>N</i>	<i>r</i>	<i>CI</i>		<i>Q_w</i>
				Lower	Upper	
Overall	52	3,559	.04	-.02	.10	139.23**
Trimmed results ^a			-.00	-.06	.06	197.03**
Moderators						
Study type						
Correlational	2	116	-.05	-.23	.14	.23
Experimental	50	3,443	.05	-.01	.11	138.15**
Induction procedure ^c						
Emotion-inducing material	14	822	.09	.00	.18	21.00 [†]
Imagery techniques	33	2,490	.04	-.03	.11	85.90**
Emotional treatment	1	49	-.57	-.73	-.34	
Combination	2	82	.14	-.36	.57	5.01*
Population type						
Child participants	2	136	-.12	-.29	.05	.91
Students	50	3,423	.05	-.01	.11	134.88**
Creativity indicator ^b						
Composite	7	410	-.13	-.36	.11	34.16**
Insight/eureka	10	684	.11	-.01	.23	20.92*
Flexibility	15	1,096	-.04	-.11	.04	21.46 [†]
Fluency	26	1,669	.09	.00	.17	68.02**
Originality	17	1,251	.11	.02	.21	42.32**
Time limitation						
Time limit	14	821	.12	.01	.22	26.74*
Unlimited	10	828	.04	-.09	.16	27.56**
Task frame ^c						
Enjoyment	6	203	.33	.04	.57	26.69**
Performance	5	186	-.24	-.50	.05	17.86**

Note. Negative-Positive (0,1); *k* = number of samples; *CI* = 95% random effects confidence intervals; *Q_w* = heterogeneity statistic.

^aSix studies were trimmed and filled.

^b*Q* for comparison between subcategories of moderator

significant at *p* < .05.

^c*Q* for comparison between subcategories of moderator significant at *p* < .01.

[†] *p* < .10.

* *p* < .05.

** *p* < .01.

negative with positive moods in an experimental design. The remaining 2 studies used mood questionnaires. We included 75 effect sizes differentiated for component of creativity. With effect sizes considered as outliers if they were larger than three standard deviations from the group mean, we found no outliers for the overall analysis.

Results revealed a non-significant and heterogeneous overall effect size, $r = .04$, $k = 52$, 95% $CI = -.02, .10$, $Q_w = 139.23$, $p < .01$. Component of creativity moderated this effect, $Q_b(4) = 10.53$, $p < .05$. Table 2.5 shows that positive moods produced more originality and fluency than negative moods but not more or less creativity for the other facets of creativity.

Effect sizes did not differ between experimental studies ($r = .05$, $k = 50$, 95% $CI = -.01, .11$) and questionnaire studies ($r = -.05$, $k = 2$, 95% $CI = -.23, .14$), $Q_b(1) = .92$, *ns*. For experimental studies, we meta-regressed creative performance on the strength of the mood induction procedure, but the result was not significant ($p > .35$). In addition, creativity effects did not differ among studies that reported mood manipulation checks and those that did not, $Q_b(1) = .00$, $p > .95$.

For experimental studies, induction method (emotion-inducing material, imagery techniques, emotional treatment, or a combination of these) was a significant moderator, $Q_b(3) = 22.74$, $p < .01$. As can be seen in Table 2.5, positive moods produced more creativity than negative moods when emotion-inducing materials were used, whereas negative moods produced more creativity than positive moods when feedback (emotional treatment) was used. It should be noted, however, that the latter result derives from a single study (Akinola & Mendes, 2007) and that dropping this study indeed yielded a non-significant effect for induction method as moderator, $Q_b(2) = .87$, *ns*.

Study population (child participants vs. undergraduate students) did not moderate the mood-creativity relationship, $Q_b(1) = 3.37$, *ns*, nor did time limitation for divergent thinking tasks, $Q_b(1) = .89$, *ns*. The meta-regression analysis in which creativity was regressed on time per task also failed to reach significance ($p > .45$).

Taken together, positive moods relate to more creativity than negative moods, but this effect is limited to originality and fluency and did not extend to insight, flexibility, or a composite index of creative performance. This finding might be taken as qualified support for the hedonic tone hypothesis in that positive moods produced more original responding than negative moods.

However, as with the positive-neutral and the negative-neutral contrasts, it is both important and interesting to note that hedonic tone in the positive-negative

contrast covaried with activation and regulatory focus. Of the samples included in the above analyses, 32 out of 58 samples contrasted sadness with happiness. These two mood states are both promotion focused, yet differ in hedonic tone and level of activation. Therefore, it may well be that the findings for the positive-negative contrast do not reflect effects of hedonic tone. Instead, they may show that promotion focused, activating mood states produce more original responding than deactivating (promotion and prevention focused) mood states. We turn to this idea below.

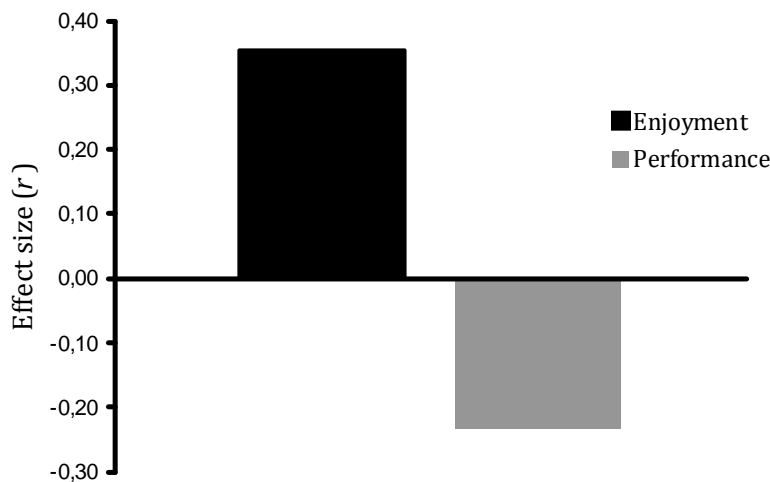


Figure 2.2. Creative Performance as a Function of Task Frame for the Positive–Negative Contrast

Recall that the mood as input perspective (L. L. Martin & Stoner, 1996) implied an interaction between mood hedonic tone (positive-negative) on the one hand, and task framing (fun, enjoyment standards, intrinsic rewards vs. serious, performance standards, extrinsic rewards), on the other. Quite consistent with this perspective, Figure 2.2 shows that negative moods tended to produce more creativity than positive moods when the task was framed as serious and performance oriented, whereas positive moods did better when the task was framed as fun and enjoyable, $Q_b(1) = 7.37, p < .01$. Although the number of studies in this analysis was somewhat limited ($k = 11$), this result supports the mood as input frameworks in which effects of moods on creativity depend on the task context.

Trim-and-Fill Estimates

To test and adjust for potential publication bias, we performed a nonparametric trim-and-fill method (cf. Duval & Tweedie, 2000) on the overall effects of the three contrasts (see Table 2.3, 2.4, and 2.5). This method offers a simple rank-based data augmentation technique and is used to estimate the number of missing studies that might exist in the meta-analysis. The method adjusts for the influence that these missing studies might have had on the estimates of the overall effect sizes of the three contrasts. The trimmed-and-filled results can therefore be taken as conservative population estimates of the effects of moods on creativity. Across the total set of 63 effect sizes of the positive-neutral contrast, 11 studies were trimmed and filled, and the overall correlation dropped slightly but remained significant (adjusted $r = .10$; 95% $CI = .05, .15$). Across the total set of 61 effect sizes of the negative-neutral contrast, 2 studies were trimmed and filled, and the overall correlation remained non-significant at $-.03$ (95% $CI = -.07, .02$). Finally, across the total set of 52 effect sizes of the positive-negative contrast, 6 studies were trimmed and filled, and the overall correlation dropped slightly and remained non-significant (adjusted $r = -.00$; 95% $CI = -.06, .06$).

Hedonic Tone, Activation, or Regulatory Focus?

The analyses thus far described and summarized past work on mood and creativity but did not speak directly to the validity of the hedonic tone, activation, or regulatory focus hypothesis. In fact, as we noted in our summaries of the effects found for the positive-neutral, negative-neutral, and positive-negative contrasts, positive hedonic tone may be important but level of activation and regulatory focus seemed to play a critical role as well.

In Table 2.1 we present a classification of a number of specific moods in terms of hedonic tone (positive vs. negative), level of activation (activating vs. deactivating), and regulatory focus (promotion vs. prevention). In Table 2.2 we show how specific contrasts among (clusters of) these specific moods might be used to discriminate among the hedonic tone, the activation, and the regulatory focus hypothesis. In this section, we report the results of this analysis. Thus, we compared effect sizes obtained when studies compared the impact of specific mood states (fear, happiness, sadness, and relaxed state) against a neutral baseline. As we showed in Table 2.1, these mood states vary among each other in hedonic tone, level of activation, and regulatory focus. Moreover, we investigated whether happiness

and sadness (both promotion focused but different in terms of hedonic tone and level of activation) differed in creative performance.

Specific expectations are provided in Table 2.2. The hedonic tone hypothesis predicts that, compared with a mood-neutral control condition, all positive moods (relaxed, happy) will promote creativity, whereas all negative moods (sad, fearful) will not. Furthermore, happiness is expected to show more creativity than sadness. Alternatively, the activation hypothesis suggests that all activating moods (fearful, happy) will promote creativity and that deactivating moods (sad, relaxed) will not. Happiness (activating) is also expected to engender more creativity than sadness (deactivating). Finally, the regulatory focus hypothesis suggests that activating and promotion focused moods will enhance creativity whereas activating and prevention focused moods will impede creativity. Thus, fear is expected to diminish creativity and happiness is expected to stimulate creativity. For the comparison between happiness and sadness, the regulatory focus hypothesis predicts that happiness (activating), relative to sadness (deactivating) will improve creative performance.

Table 2.6

Meta-Analysis of the Relationship of Fear, Sadness, Relaxed State, and Happiness With Creative Performance

Contrast (0,1)	<i>k</i>	<i>N</i>	<i>r</i>	<i>CI</i>		<i>Q_w</i>
				Lower	Upper	
Neutral–Fear	20	1,132	-.12	-.22	-.02	47.47**
Neutral–Sadness	21	1,746	.02	-.05	.08	27.80
Neutral–Happiness	53	4,408	.17	.13	.22	108.69**
Neutral–Relaxed state	3	750	.01	-.06	.08	.50
Sadness–Happiness	32	2,214	.05	-.02	.13	89.85**

Note. *k* = number of samples; *CI* = 95% random effects confidence intervals; *Q_w* = heterogeneity statistic.

* *p* < .05. ** *p* < .01.

Results for the comparison of fear, sadness, happiness, and relaxed state with a neutral baseline showed that the effects differed among each other, $Q_b(3) = 38.37$, $p < .01$. Table 2.6 shows that compared with a neutral baseline, fear (negative, activating, and prevention focused) has a negative impact on creativity ($r = -.12$, $k = 20$, 95% *CI* = -.22, -.02). This is consistent with the hedonic tone and regulatory focus

hypothesis and speaks against the activation hypothesis. Second, sadness (negative, deactivating, and promotion focused) does not promote or inhibit creativity ($r = .02$, $k = 21$, 95% $CI = -.05, .08$). This is consistent with all three hypotheses. Third, happiness (positive, activating, and promotion focused) has a positive impact on creativity ($r = .17$, $k = 53$, 95% $CI = .13, .22$), which also is consistent with all three theories. Fourth, being in a relaxed mood state (positive, deactivating, and prevention focused) does not relate to more or less creativity ($r = .01$, $k = 3$, 95% $CI = -.06, .08$). This is consistent with the activation and regulatory focus hypothesis and speaks against the hedonic tone hypothesis. Fifth and finally, happiness does not relate to more or less creativity than sadness ($r = .05$, $k = 32$, 95% $CI = -.02, .13$). This is inconsistent with all three hypotheses (but see below).

To better understand these findings, we also conducted moderator analyses for these contrasts. First, study design did not moderate the effect for any of the five contrasts, all $Q_{bs}(1) < .70$, *ns*. Further, component of creativity did not moderate the sadness-neutral contrast, the relaxed state-neutral contrast, or the happiness-neutral contrast, all $Q_b(4) < 7.00$, *ns*. Component of creativity did not moderate the fear-neutral contrast either, $Q_b(4) = 7.44$, $p = .11$. However, from this analysis, it appeared that the overall negative effect of fear holds for flexibility ($r = -.20$, $k = 13$, 95% $CI = -.31, -.09$) more than any other component of creativity (see Table 2.7). Finally, component of creativity moderated the happiness-sadness contrast, $Q_b(4) = 12.90$, $p = .01$. As can be seen in Table 2.7, sadness produced more creativity than happiness with regard to the composite measure, whereas happiness tended to produce more fluency and originality. Although not significant (see Table 2.7), this last trend clearly is in line with all three hypotheses. For the composite measure only, sadness produced better performance than happiness, but this involved only 2 studies with a relatively small number of participants (combined $N = 75$). Close inspection of these two studies showed that they were unpublished dissertations (Orenbakh, 2002; Tighe, 1992) in which mood was induced through film clips, and in both studies the manipulation checks for mood failed to produce significant results. Although, in general, our meta-analysis revealed that the strength of manipulation had no meaningful impact on our results, the rather anomalous finding that sadness produced more creativity than happiness may be attributed to a failure to successfully induce sadness versus happiness in these two studies. We are thus cautiously inclined to conclude that happiness tends to produce more creativity than sadness.

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Table 2.7

Meta-Analysis of the Neutral-Fear Contrast and the Sadness-Happiness Contrast Across Different Creativity Indicators

Creativity indicator	<i>k</i>	<i>N</i>	<i>r</i>	<i>CI</i>		<i>Q_w</i>
				Lower	Upper	
Neutral–fear (0,1)						
Composite	4	331	-.07	-.31	.17	13.60**
Insight/eureka	2	183	-.03	-.17	.12	.11
Flexibility	13	571	-.20	-.31	-.09	21.20*
Fluency	3	146	.09	-.19	.36	5.74†
Originality	2	99	.03	-.17	.23	.86
Sadness–happiness (0,1) ^a						
Composite	2	75	-.26	-.46	-.03	.94
Insight/eureka	6	518	.08	-.07	.24	14.14*
Flexibility	10	641	-.06	-.16	.04	14.56
Fluency	18	1,115	.11	-.01	.22	60.28**
Originality	9	634	.12	-.01	.24	19.28*

Note. *k* = number of samples; *CI* = 95% random effects confidence intervals; *Q_w* = heterogeneity statistic.

^a*Q* for comparison between subcategories of moderator significant at *p* < .05.

† *p* < .10. * *p* < .05. ** *p* < .01.

All in all, the activation hypothesis and the hedonic tone hypothesis received some support (four out of five hypotheses were supported), and the regulatory focus hypothesis received full support (five out of five hypotheses were supported). In particular, the negative effect of fear on creativity – and especially flexibility – is inconsistent with the activation hypothesis, and the null-effect of relaxed mood states on creativity is inconsistent with the hedonic tone hypothesis. Both effects, however, were in line with the regulatory focus hypothesis. Finally, it should be noted that a few relevant moods could not be included in the meta-analysis because only single studies were available (see also Footnote 5). One prominent example is anger. We are aware of two studies involving anger, one comparing anger with relaxed moods (De Dreu, 2006) and the other comparing anger with happiness (Russ & Kaugars, 2001). These studies show that anger produced more creativity than relaxed moods, and comparable levels of creativity to happiness. This pattern contradicts the hedonic tone hypothesis, but is in line with both the activation and

the regulatory focus hypotheses. As such, the finding further supports the conclusions we derive from the meta-analysis. However, these are single studies and this additional evidence is at best suggestive.

GENERAL DISCUSSION

This meta-analysis of the mood-creativity relation is the first to consider, in a side-by-side manner, creative performance as a function of specific mood states. We also tested three more or less contrasting hypotheses on the basis of the notion that mood states can be differentiated in terms of hedonic tone, the level of activation, and their association with regulatory focus. In total we included 66 reports with a total of 102 independent samples and over 7,000 research participants. Our results yield several important insights that we address in the remainder of this section. First, the mood-creativity link is better understood as a function of various aspects of specific moods than simply in terms of hedonic tone or level of activation. As we elaborate upon on this idea below, we note that a mood state's associated regulatory focus appears to be critically involved as well. Second, decomposing creative performance into several facets highlights the fact that some mood states reliably influence some facets of creativity but not others, and that other mood states influence other facets more. Third, moderator analyses across and within the positive mood—neutral control, the negative mood—neutral control, and the positive mood—negative mood contrasts revealed that findings tend to generalize across populations, study design, and strength and type of the mood induction procedure, although a few noteworthy exceptions were uncovered. Fourth, and finally, our review highlights important biases in the mood-creativity literature, with some mood states being heavily studied and others being rarely examined. This, we argue below, impedes our understanding of the mood-creativity link and requires research into specific moods using different induction methods and assessment instruments.

Side-by-Side Comparisons of the Three Contrasts in the Mood-Creativity Link

We began our analyses with a description of the strength and direction of three broad contrasts—between positive moods and mood-neutral controls, between negative moods and mood-neutral controls, and between positive and negative moods. We found a reliable tendency ($r = .15$) for positive moods to relate to more creativity than mood-neutral controls. This enhancing effect of positive moods was more pronounced for experimental than correlational studies. For the

negative mood-neutral control contrast, the overall effect was small and non-significant ($r = -.03$). However, further exploration between study designs (correlational vs. experimental) showed that for the correlational studies only, negative moods tended to relate to less creativity than mood-neutral controls ($r = -.08$). Finally, for the positive-negative mood contrast, the overall effect was small and non-significant ($r = .04$) and did not differ as a function of study design (experimental vs. correlational).

With regard to causality, we can thus conclude that, in general, positive moods produce more creativity than do mood-neutral controls. Second, negative moods do not produce less creativity than mood-neutral controls; however, negative effects were found for correlational studies and, as we elaborate below, these mostly involved fear and anxiety, moods that the regulatory focus hypothesis predicts will impair creativity. Third, positive moods do not produce more creativity than negative moods. However, when (for experimental studies) we included task framing as a moderator, we saw that positive moods lead to more creativity when the task is framed as enjoyable and intrinsically rewarding and to less creativity when the task is framed as serious and extrinsically rewarding and when performance standards are emphasized (L. L. Martin & Stoner, 1996).

Experimental studies mostly involved students, whereas questionnaire studies involved both students and participants drawn from the general population (e.g., child participants, company workers). Because we found that the effects for the positive-neutral and negative-neutral contrast differed between experimental and correlational studies, results point to the possibility that it is the specific combination of methodology and participant population that produced the effects. We therefore included population type (child participants, undergraduate students, and general adult population) as a moderator but analyses for each of the three contrasts revealed no reliable differences. This suggests that current findings generalize across different populations and are not limited to undergraduate (psychology) students.

For experimental studies, induction method (imagery techniques, emotion-inducing materials, emotional treatment, or a combination of induction procedures) initially proved to be a reliable moderator for the positive-neutral and positive-negative contrast. However, for both contrasts this effect was driven by one study (Akinola & Mendes, 2007) that adopted an emotional treatment procedure and showed that positive moods relate to less creativity than negative moods and mood-neutral control states. Excluding this study from our moderation analyses revealed

that effects generalized across induction procedures. Furthermore, manipulation check features (e.g., strength of manipulation, report of manipulation checks) did not produce any reliable effects for each of the three contrasts. It thus appears safe to conclude that effects generalize across induction procedures, manipulation strength, and whether mood manipulation checks were reported.

Theoretical Implications and Avenues for Future Research

Before delving into the theoretical and practical implications of our findings, it is important to first discuss the overall impact mood appears to have on creative performance. It is difficult to evaluate effect sizes. Nevertheless, Cohen (1988) suggested as a heuristic to consider effect sizes above $r = .50$ as large, those around $r = .30$ as moderate, and those around $r = .10$ as small, and McGrath and Meyer (2006) argued that .37, .25, and .10 are reasonable benchmarks for correlation coefficients. Our largest overall effect size, for the positive mood-neutral baseline contrast, was $r = .15$ (or $r = .10$ after trim and fill; see Table 2.3) and even breaking the sample down by moderators only occasionally led to a substantial increase in effect size. For example, the positive-negative mood contrast was positive and of moderate size ($r = .33$) when tasks were framed as enjoyable and intrinsically rewarding. That effect sizes for the mood-creativity relationship were, across the board, fairly small begs two questions. First, how does this compare with other meta-analytic findings in (social) psychology? Second, one may wonder whether, in pursuing the aim to understand what is driving creative performance, studying mood effects is the most obvious way to go – there may be more important factors driving creative performance.

Recently, Richard, Bond, and Stokes-Zoota (2003) collected and compared a large number of meta-analyses in social and personality psychology on a wide variety of topics, including aggression, attitude change and social influence, stereotyping, and so forth. In one analysis, these authors assessed the mean and variability in effect sizes across these meta-analyses and found that the mean effect size was $r = .21$, with a standard deviation of .15. The median was $r = .10$ and as such, one may conclude that current findings fit well with the overall strength of effects reported in social and personality psychology. However, such a conclusion holds only for subsets of our findings, and for many other results, the mood-creativity effect clearly falls below both the mean and the median of what is typical in (social and personality) psychology.

That effect sizes are indeed small, both in absolute and relative terms, increases the relevance of our second question: Should researchers continue to concern themselves with mood when trying to predict creative performance, or should they instead reorient their efforts? From a utilitarian perspective, the answer is probably affirmative: To make a difference in creative performance, manipulating mood states is not very effective and is unlikely to produce clear and visible changes in creativity (but see below when we discuss practical implications).

From an epistemological perspective, investing in further understanding of the mood-creativity relationship may be a worthwhile enterprise for two reasons. First, it is important to realize that small effects can be impressive when they are obtained under rather minimal conditions. Prentice and Miller (1992) persuasively argued that, in many cases, researchers do not design their studies to explain the most variance in a particular dependent variable, but rather seek the limits of a particular effect by using minimalist approaches. They concluded that “in such cases, a small effect size, low multiple correlation or negligible path value will not lead these investigators to question their conclusions. On the contrary, they will be pleased that their effect survived the toughest test they could give it and will be more convinced than ever of its importance” (p. 164). Showing that giving participants a small bag of candy leads to mild increases in happiness and more creativity as such is a rather impressive demonstration of the general idea that happiness promotes creative performance.

The second reason why we believe that this meta-analysis should stimulate rather than halt research on the relationship between mood and creativity is that we found substantial variance in effects across studies. This suggests that, in general, the relationship between mood states and creative performance is still poorly understood. Below we discuss in more detail the psychological mechanisms underlying mood-creativity effects and highlight avenues for future research.

Hedonic Tone, Activation, and Creativity

The results of this meta-analysis clearly indicate that the relation between mood and creativity cannot be understood in terms of hedonic tone alone. Neither can results be understood in terms of level of activation alone. Rather, it seems that at the least hedonic tone and activation interact. That is, we found that only activating positive moods (i.e., happy, elated), but not deactivating positive moods (i.e., relaxed, serene) are associated with higher levels of creativity than mood-neutral controls. This maps onto recent research showing that positive activating

moods, such as happiness, increase cognitive flexibility and fast and global processing, which in turn leads to higher levels of creativity, fluency and original responding (De Dreu et al., 2008; Hirt, Devers, & McCrea, 2008). Thus, in comparing positive mood states to mood-neutral controls, it appears that the level of activation plays an important moderating role. This emerging insight contrasts with conclusions reached in previous narrative reviews. For example, Ashby et al. (1999) concluded that “...there is substantial reason to believe that affect and arousal are not synonymous ... and that the increases in cognitive flexibility and creative problem solving reported in so many articles are indeed due to positive affect, not simply to increases in arousal” (p. 532; also see Lyubomirsky et al., 2005).

With regard to negative mood states, an interpretation in terms of hedonic tone and activation fares less well. No overall main effect of negative moods was found as compared with a neutral baseline. However, whereas sadness was not associated with creativity, fear and anxiety were negatively related to creativity, albeit especially with regard to flexibility and not with regard to fluency, originality, or other components of creativity. This result is not incompatible with recent studies by De Dreu et al. (2008) who argued and showed that activating negative moods, such as anger and fear, may promote creative fluency and originality (but not flexibility) more than deactivating negative mood states such as sadness. However, these authors proposed that this is not because of enhanced cognitive flexibility and fast, global processing (as in the case of activating positive moods) but rather because of increased cognitive persistence, and time-consuming, effortful, and analytical probing of alternatives. Thus, this analysis would predict fear and anxiety to produce less cognitive flexibility (which was indeed found) and perhaps more fluency and persistence than mood-neutral controls.

Not all results were supportive of an Activation x Hedonic Tone interpretation. Activating positive moods did not impact flexibility more than fluency, and although sadness should produce less creativity than happiness, this is not what was found. Moreover, a strong test of the Hedonic Tone x Activation interpretation was prohibited on account of the low number of studies involving such specific moods as anger and relaxed state. Although a meta-analysis cannot be compared directly with results of primary studies in which mediating processes are measured or manipulated (Stroebe & Diehl, 1991), the inconsistencies suggest that there is more to the mood-creativity relationship than hedonic tone, activation, or their interaction.

Regulatory Focus, Activation, and Creativity

The regulatory focus hypothesis that activating, promotion-related mood states enhance creativity, whereas activating, prevention-related mood states undermine creativity was generally well supported. Whereas deactivating moods were not found to be related to creativity (sadness or relaxed state), activating mood states with a promotion focus (happiness) were positively related to creativity, and activating moods with a prevention focus (i.e., fear) were negatively related to creativity. However, as mentioned, the effects of fear were only found for flexibility measures of creativity.

Although the results were generally more in line with a regulatory focus account than with a hedonic tone or activation account, we need to be careful in interpreting the results, and the available evidence is certainly not conclusive. First, in a few cases, only a handful of studies were available, and more studies on anger and on relaxed mood states are needed to be on firmer ground with regard to the regulatory focus hypothesis. In a related manner, some relevant mood states have not yet been examined. An example is disgust, an activating prevention focused state, which would relate negatively to creativity. Second, the regulatory focus hypothesis predicts happiness to produce more creativity than sadness; both are associated with a promotion focus but the former is more activating than the latter. However, only a trend toward such an effect on fluency and originality, but not on other indicators of creativity, was found. Finally, the findings on fear are based on correlational studies, prohibiting conclusions about causality.

Associating mood states with a specific regulatory focus is a relatively new development in the literature on mood and emotion (Higgins, 2006; Idson et al., 2000) and direct evidence for such associations is still missing. Granted, regulatory foci are closely related to approach (promotion) and avoidance (prevention) tendencies (e.g., Shah, Higgins, & Friedman, 1998; see also Friedman & Förster, 2000, 2002), and there is strong evidence for a link between specific mood states and approach and avoidance tendencies, both in motivation and action (Frijda, 1986). Frijda et al. (1989), for example, found that fear and anxiety, as well as disgust and aversion, were associated with the action tendency of avoidance. Enthusiasm, joy, and happiness (among others) were associated with approach tendencies. Sadness was associated with neither approach nor avoidance tendencies. Anger, rage, and contempt, were associated with antagonistic tendencies (i.e., moving against), but have also been associated with approach motivation (Carver, 2004; Harmon-Jones & Sigelman, 2001). The current support for the

regulatory focus hypothesis could be taken as further indication for this close association between mood states and regulatory foci. Clearly, however, primary research is needed to further substantiate these claims.

Other Aspects of Mood That May Drive Creative Performance

We focused on hedonic tone, activation, and regulatory focus because these three aspects of mood states had been meaningfully related to creative performance. Whereas our results support this decision in that indeed clustering mood states along these dimensions accounted for variance in study findings, this should not be taken to mean that other aspects of mood states have no relevance to creativity.

Mood states also differ on a number of appraisal dimensions, such as certainty, expectedness, importance, and controllability (e.g., Frijda et al., 1989; see also Roseman et al., 1994; C. A. Smith & Ellsworth, 1985) and some of these may relate to creativity. One candidate is certainty, and a hypothesis might be that mood states that relate to higher levels of certainty, such as anger, joy, and pride are associated with higher levels of creativity than mood states that relate to uncertainty, such as fear. States that are unrelated to certainty, such as indifference or sadness, might not be related to creative performance, and states that are related to uncertainty may reduce creativity performance (cf. Probst, Stewart, Gruys, & Tierny, 2007). Another candidate is risk-tolerance triggered by mood states, and a hypothesis might be that mood states that increase risk-tolerance, such as anger, trigger more original responding than mood states that increase risk-aversion, such as fear (cf. Lerner & Keltner, 2001).

The evidence presented here is about the influence of moods on creativity and we cautiously suggest that the regulatory focus and level of activation of a particular mood state are the most important drivers of creativity. This does not imply that regulatory focus and level of activation are the only mood dimensions that drive effects on creativity and we already discussed the possibility that other dimensions might also play a role. Furthermore, our results and conclusions do not necessarily generalize to other dependent variables that are known to be influenced by mood (see e.g., Forgas, 2001; Lyubomirsky et al., 2005). Thus, current results should not be taken to suggest that regulatory focus, rather than spreading activation of hedonic tone, accounts for the finding that happy people produce more positively valenced associations to ambiguous words and have higher estimates of the likelihood of the occurrence of positive events, whereas anxious or angry people produce more negatively valenced associations to ambiguous words and have

higher estimates of the likelihood of the occurrence of negative events (e.g., Bower, 1981; Bower & Forgas, 2001; Mayer, Gaschke, Braverman, & Evans, 1992). Likewise, self-regulation and activation may add little to the explanation of well-documented effects of positive mood states on helping and cooperation (e.g., Carnevale & Isen, 1986; Isen & Levin, 1972; Staw & Barsade, 1993).

Processes Mediating the Effects of Mood on Creativity

Throughout the years, several mechanisms have been suggested to account for the mood-creativity link. Effects for hedonic tone have been argued to be mediated by neurophysiological mechanisms, such as those proposed in the dopaminergic theory of positive affect (Ashby et al., 1999, 2002), and cognitive mechanisms. For example, it has been argued that positive affect cues richly associated material in memory (e.g., Isen & Daubman, 1984; Isen et al., 1987), cues the use of simplifying heuristics and “loose” processing (cf. Fiedler, 2000), and triggers a broader and more inclusive cognitive processing style (e.g., Friedman & Förster, 2002). Effects for activation have been argued to be mediated by motivated effort and increased cognitive performance (De Dreu et al., 2008; Dietrich, 2004), and effects for regulatory focus have been argued to be mediated by global versus local processing styles along with engagement strength (Friedman & Förster, 2008; Higgins, 2006).

The lack of straightforward main effects for hedonic tone or for activation suggests that creativity cannot be understood simply in terms of one of these proposed mechanisms and, instead, should be seen as a complex function of neurophysiological, cognitive, and motivational processes. Although these underlying mechanisms are hard to observe directly at the behavioral level of creative performance, we propose that there are two ways to approach this issue. One way is to carefully distinguish among different facets of creative performance. Theories might be built on how mood states impact specific mechanisms and thereby have specific effects on certain indicators of creative performance (and not on others). The second approach is to look at moderators of the mood-creative performance relation. Situational factors might impact certain processes more than others, and moderation-of-process designs can be used to test predictions resulting from different theoretical perspectives (Spencer, Zanna, & Fong, 2005).

The current meta-analysis used both of these procedures to clarify the mood-creativity link. By systematically coding and analyzing specific facets of creativity we were able to provide an overview of creativity-related indicators, such as fluency,

cognitive flexibility, originality, and performance on insight and eureka tasks. Although for most specific mood states, effect sizes were similar across specific facets of creativity, we detected one important exception. When considering fear and anxiety against a mood-neutral control condition, we found that fear and anxiety reduced cognitive flexibility but not any other creativity facet. This may suggest that cognitive flexibility is not the only mediator between mood states and facets of creative performance, such as ideational fluency and original problem solving. Ideational fluency and original solutions may also be achieved through motivated effort and persistence on a creativity task (De Dreu et al., 2008; Rietzschel et al., 2007a, 2007b; Simonton, 1997).

That moderation-of-process designs are useful for detecting underlying mechanisms is illustrated by two of the current findings. First, we found that when the creativity task was framed in terms of fun and enjoyment, participants in a positive mood were more creative than those in a negative mood. When the task was framed as serious or performance-related, however, participants in a negative mood tended to be more creative (although the latter effect failed to reach significance). This finding is consistent with a mood as input account that motivational implications of people's moods are mutable (e.g., L. L. Martin & Stoner, 1996; Schwarz & Clore, 1996). Dependent on task setting, participants in positive and negative moods exert more or less effort and are more or less creative as a consequence. As such, this is quite revealing about the motivational processes underlying the mood-creativity relationship. The second finding was that the effect of positive moods on creativity diminished with longer time on task. This is consistent with the idea that positive tone facilitates fast and global processing and cognitive flexibility (Ashby et al., 1999; De Dreu et al., 2008; Hirt et al., 2008) and that, through effort and persistence, participants in a neutral mood are eventually able to catch up.

Taken together, we propose that new insights and original responses may be a function of either cognitive flexibility (broad conceptual attention, accessing multiple cognitive categories), or cognitive persistence (focused attention, persevering within few cognitive categories). Some activating mood states will have their effects on insight and originality because they increase cognitive flexibility; others will have their effects because they increase cognitive persistence. Perhaps a promotion focus triggers cognitive flexibility more, and perhaps a prevention focus triggers cognitive perseverance more. To further examine these emerging insights, new research needs to carefully consider and choose its tasks and dependent

measures. An important insight here is that what task is being used, and what facet of creativity is being examined, determines the type of conclusion one reaches. When, for example, fear is induced and performance on insight tasks is measured, not much of an effect may be found and one may be tempted to conclude that fear does not relate to creativity. Had one assessed cognitive flexibility, however, different results might have been found and different conclusions might have been reached.

Practical Implications

Three practical implications of our results may be noteworthy. Throughout our analyses we found that activating mood states produce more creativity than deactivating mood states and there were strong indications that this was particularly the case when mood states were associated with a promotion rather than a prevention focus. This finding has implications for practice, in that it runs counter to the widespread belief that creative ideas emerge when people are relaxing in the bathtub or dozing away during a train ride. Our meta-analysis and the results of many primary studies suggest that seeking out such relaxing situations can actually be quite counterproductive and is unlikely to yield novel insights, creative ideas, and original products. Put differently, to promote creativity among employees, artists, scientists, or schoolchildren, inducing an activated and promotion focused state may be more fruitful—anger and happiness should be cherished and sadness and relaxation should be frowned upon.

Our results for task framing also have important implications for practice. Managers seeking to bolster creativity in their employees, teachers desiring to elevate creative problem solving among their pupils, and parents trying to bring out the artistic talents in their children all need to fit their mood inductions to the ways in which they frame the tasks their employees, pupils, and children perform. Increasing feelings of happiness and joy are unlikely to produce creativity when the task is framed as “serious business on which your annual bonus (or your final grade, or your pocket money) substantially depends.” It would be much better to match such induced feelings of happiness and joy to framing the task as “enjoyable and interesting to do.” However, when employees are feeling grumpy, when pupils are having a bad hair day, or when children are struck by winter depression, framing the task as serious and consequential to extrinsic rewards may actually help elevate their level of creativity.

The third practical implication of our results pertains to the ways in which future research on specific mood states can be designed and, in particular, to the choice of mood measurement or manipulation. The measures and manipulation summarized in the present meta-analysis differ in the specificity and range of moods they assess and, in turn, differ in the range of mood dimensions they tap into. The STAI (Spielberger, 1968) is specifically aimed at trait and state anxiety, whereas the Negative Affect Scale (Watson et al., 1988) encompasses different mood markers, such as afraid, tense, hostile, and irritable. Likewise, a documentary film depicting Nazi concentration camps (Isen et al., 1987) may evoke sadness, anger, or disgust. Pertaining to the range of moods, most studies using film clips or Velten procedures induce sad and happy moods, whereas self-generated imagery has been used to induce happy, relaxed, fearful, angry, sad, depressed, happy, and elated moods. Given that mood dimensions, such as level of activation and regulatory focus, moderate the impact of moods on creativity, the specific choice of induction method and assessment instrument may have great impact on findings concerning creative performance. Once again, future research would benefit from a careful and calibrated choice of what specific mood state to induce or measure, and with what method or instrument.

Concluding Thoughts

In their 2002 annual review chapter Brief and Weiss stated “...it is apparent that discrete emotions are important, frequently occurring elements of everyday experience. Even at work—perhaps especially at work—people feel angry, happy, guilty, jealous, proud, etc. Neither the experiences themselves, nor their consequences, can be subsumed easily under a simple structure of positive or negative states” (p. 297). Our results underline this observation and even suggest that, for creativity, hedonic tone is far less important than is often assumed. Our decision to go beyond hedonic tone and to include other dimensions that distinguish moods from one another turned out to be quite insightful. Instead of hedonic tone, it appears that it is a combination of promotion focus with high levels of activation that drives mood effects on creative performance. Furthermore, we obtained some indications that some mood states may have their effects on original insights and ideas because of enhanced flexibility, whereas others have their effects because of enhanced cognitive persistence. We need to be cautious, however, because not all mood states were equally well represented in the literature, and a comprehensive assessment of the various facets of creativity was not always achieved. Herein lie

important avenues for future research, which eventually will tell us when and why angry young men, happy campers, and sad loners create and innovate.