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

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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.

Keywords: mood, creativity, regulatory focus, hedonic tone, level of activation

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> "The artist is a receptacle for emotions that come from all over the place: from the sky, from the earth, from a scrap of paper, from a passing shape, from a spider's web."
>
> —Picasso, quoted in Christian Zervos, *Conversation avec Picasso [Conversation with Picasso]*

> "Feeling and longing are the motive forces behind all human endeavor and human creations."
>
> —Albert Einstein, *Religion and Science*

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, in press). 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, Isen, and Turken (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, King, and Diener (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)

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However, this general conclusion is countered by important exceptions suggesting that people in a positive mood are sometimes less creative then 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).

Our goal in the current research was threefold. 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 multifaceted 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 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, Baas, & Nijstad, 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 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 (Guil-

ford, 1967; Torrance, 1966). Fluency refers to the number of unique, nonredundant 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 Association Test (Mednick, 1962), analogy tests, and anagram tasks. For example, the Remote Association 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 Association 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 coworkers (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, De Dreu, & Nijstad, 2007), 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 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; 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; Ashby, Valentin, & Turken, 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).[1] Positive moods signal a satisfactory and safe state of affairs, suggesting to individuals in a positive mood that processing requirements 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, & Süsser, 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, Sujan, Hirt, & Sujan, 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.[2]

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, Ward, Achée, & Wyer, 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 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

[1] Although differences exist with regard 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; Mackie & Worth, 1989; Mano, 1992; L. L. Martin & Stoner, 1996; vs. Isen, 2000a; Staw & Barsade, 1993).

[2] 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.

(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 avoidance, 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, Friedman, Özelsel, & Denzler, 2006; Förster & Higgins, 2005; Friedman & Förster, 2005). 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, Friedman, & Liberman, 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, 2004; 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.

Positive and negative mood might lead one either to high motivated state or low motivated state (i.e. high or low hedonic tone). Depending upon the level of motivation for dsired goal, creative performance is modulated.

Example:

Positive mood + High motivational state - rewards during performance - good performance in pre and mains.

Positive Mood + Low motivational state - rewards after performance i.e. completion of the task - Final selection in CSE.

Negative mood + High motivational state - No selection but further attempts left.

Another example: Creativity enhanced after breakup e.g. poetry, art etc

Negative mood + Low motivational state - No final selection and all attemps exhausted.

Also, context dependent memory/cue activation.

Symbols, associated/conditioned with specific mood state, will get actively involved in novel rearrangement process.

Fluency, cognitive flexibility and originality, all of these much depends on how well efficient one has been in abstraction and conceptual blending.

For example, while solving a problem in a positive mood, one would rarely access tools, symbolically conditioned with negative affact or specific emotion and vice-versa.

Context dependent/affective state dependent memory/brain activation has it's own functional significance - while dealing with a grave danger, whole brain activation would severely compromise much needed situation specific cognitive efficiency - it was much economical to activate only relevant brain regions/memory links.

Memories of positive experiences in positive affect and vice-versa.