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### The psychology of creativity : moods, minds, and motives

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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, etcetera. Neither the experiences themselves, nor their consequences, can be subsumed easily under a simple structure of positive or negative states. (Brief & Weiss, 2002, p. 297)

Quite consistent with this observation, in the present dissertation, I showed that specific positive and negative mood states may be distinguished in terms of their level of activation (activating vs. deactivating; cf. Russell & Barrett, 1999), and their motivational orientation (approach and promotion focus vs. avoidance and prevention focus; cf. Carver, 2004; Higgins, 1997; Mowrer, 1960). Moreover, the results indicate that when it comes to creative performance, hedonic tone is far less important than is often assumed, whereas activation and motivational orientation appear to play a crucial role. Finally, the effects of specific moods on the creative process involve basic regulatory principles and mechanisms that include resource mobilization, processing modes, and resource depletion.

The results show, first and foremost, that creativity is enhanced when the individual is cognitively activated. Second, the results point to the possibility that activating states that associate with an approach orientation may have their effects primarily through the use of broad and inclusive cognitive categories, and global (as opposed to local) processing of information (i.e., flexibility), whereas activating states that associate with an avoidance orientation may have their effects primarily through prolonged and systematic exploration of a few possible solutions and perspectives (i.e., persistence). Third and finally, I identify an important boundary condition for this so-called “activation-effect:” although the mobilization of energy and resources shows up in relatively high levels of creativity early on, resources are also limited in their availability, and due to resource depletion, creative performance may be substantially reduced at later stages. In this chapter, I will first discuss the main findings of chapters 2 to 4 in terms of the Dual Pathway to Creativity Model (De Dreu et al., 2008) and I will identify implications for research on mood and on creativity. Then I discuss some limitations to the findings of this dissertation and highlight avenues for future research. I conclude this chapter with practical implications for managers, teachers, and parents about how to boost creativity of their employees, pupils, and children.

### **Dual Pathway to Creativity Model**

In an attempt to understand and explain trait and state-based variations in creativity, the Dual Pathway to Creativity model (DPCM) identifies two pathways to creativity (Baas et al., 2008; De Dreu et al., 2008; Nijstad et al., 2010; Rietzschel et al., 2007a). Originality, fluency, and creative insights can be achieved through enhanced cognitive flexibility: the relying on many broad and inclusive cognitive categories, the use of flat associative hierarchies, and the engagement in global (as opposed to local) processing of information (e.g., Förster, 2009; Hirt et al., 2008; Mednick, 1962; Murray et al., 1990). Alternatively, many and uncommon ideas, insights, and associations can result from enhanced cognitive persistence: the prolonged and systematic exploration of a few possible categories in great depth and the use of a narrow processing mode (e.g., Boden, 1998; Dietrich, 2004; Rietzschel et al., 2007a, 2007b).

Furthermore, DPCM proposes that any trait or state that stimulates flexibility and/or persistence will increase creativity. Whether the flexibility and/or persistence pathway is engaged depends, first and foremost, on the extent to which the individual is cognitively activated, which involves the recruitment of cognitive resources (cf. Gailliot et al., 2007), the readiness to take action (cf. Carver, 2004; Frijda, 1986), the release of certain neurotransmitters (cf. Ashby et al., 2002; Dreisbach & Goschke, 2004), and the degree to which the individual feels alert, aroused, and engaged (cf. Russell & Barrett, 1999). First, being activated leads to task engagement and motivation to consider the issue at hand (Brehm, 1999; Broadbent, 1972; Dietrich, 2004; Frijda, 1986). Second, moderately high levels of cognitive arousal improve a number of cognitive functions that are important for creativity to come about - these include working memory performance, cognitive flexibility, sustained attention, and cognitive persistence (e.g., Ashby et al., 2002; Dreisbach & Goschke, 2004; Flaherty, 2005; Floresco & Phillips, 2001; J. A. Gray, 1982; Robbins, 1984). In other words, cognitive activation and engagement is needed to trigger both the cognitive flexibility and persistence pathway, thereby stimulating creativity. And indeed, in a first test of DPCM, we found that activating moods (happy, joyous, angry, fearful) led to greater creativity than deactivating moods (sad, depressed, serene, relaxed) and the mood-neutral control condition (De Dreu et al., 2008).

Finally, DPCM proposes that some activating states and traits may affect creativity primarily through their influence on cognitive flexibility, while other activating states and traits affect creativity primarily through their influence on

cognitive persistence. For example, traits and states that facilitate creativity mainly through cognitive flexibility include intrinsic motivation that has been linked to cognitive play and a willingness to explore alternative courses of action (Amabile, 1996), happiness and joy that have been linked to the use of broad and inclusive categories (De Dreu et al., 2008; Fredrickson, 2001; Murray et al., 1990), and approach-related states that associate with global (as opposed to local) processing modes (Förster et al., 2006). Traits and states that facilitate creativity mainly through cognitive persistence include Personal Need for Structure (PNS) that has been linked to structured and focused idea generation (Rietzschel et al., 2007a), the anticipation of conflict that has been associated with a narrow focus of attention (De Dreu & Nijstad, 2008), and anger and fear that have been linked to systematic, constrained, and analytical information processing (De Dreu et al., 2008). Below, I will discuss the main findings of this dissertation in terms of DPCM.

### **Meta-Analysis: Hedonic Tone, Activation, or Motivational Orientation?**

In Chapter 2, I reported on a meta-analysis of the effects of specific mood states (happy, relaxed, sad, fearful, and angry) on creativity. The first goal was to examine whether the inconsistencies in past work on the mood-creativity relationship could be explained in terms of DPCM. Moreover, it was argued that specific mood states can be differentiated in terms of hedonic tone (positive vs. negative), level of activation (activating vs. deactivating), and motivational orientation (approach vs. avoidance) and these are mood dimensions that have been meaningfully related to flexibility, persistence, and to creative performance in general. Therefore, another goal of the meta-analysis was to understand whether the mood-creativity relation is better understood in terms of hedonic tone, level of activation, motivational orientation, or combinations of these three dimensions.

Findings showed that the mood-creativity link is better understood as a function of a mood state's associated level of activation and motivational orientation than simply in terms of hedonic tone. Consistent with DPCM, it was found that deactivating mood states (e.g., relaxed state, sadness) are not related to creativity. In comparison to mood-neutral states, a relaxed state, a deactivating positive mood state associated with an avoidance orientation, was not related to creativity ( $k$  [number of studies] = 3,  $r = .01$ ), as was the case for sadness, a deactivating negative mood state associated with an approach orientation ( $k = 21$ ,  $r = .02$ ). Consistent with DPCM, it was also found that activating mood states that are associated with an approach orientation (e.g., happiness, anger) were associated with increased levels

of creativity. In comparison to mood-neutral states, happiness was associated with greater levels of creativity ( $k = 53, r = .17$ ) and anger produced more creativity than relaxed moods (De Dreu, 2006) and comparable levels of creativity to happiness (Russ & Kaugars, 2001). However, because only two studies that were included in the meta-analysis involved anger, clearly more research was needed to explore the role of anger in the creativity process. This void was filled in Chapter 3.

Finally, and inconsistent with the idea that activating moods would enhance creativity, findings showed that fear, an activating negative mood state associated with an avoidance orientation, was negatively related to creative performance ( $k = 20, r = -.12$ ). However, three cautionary notes must be raised here. First, follow-up analyses showed that only measures of cognitive flexibility were negatively related to fear ( $k = 13, r = -.20$ ), but not other indicators of creativity, such as fluency or originality. Second, the findings on fear were based on correlational studies, prohibiting conclusions about causality. Third, although consistent with the finding that avoidance orientations are not or negatively related to creativity (Friedman & Förster, 2000, 2002), experimentally induced activating and avoidance-related mood states, such as fear and anxiety, have been found to promote creative performance (e.g., De Dreu et al., 2008). In short, a true understanding of the interplay between motivational orientation, specific mood states, and creative performance needed more work. Achieving this was the goal of Chapter 4.

### **The Role of Anger in Creativity**

Chapter 3 examined whether and why anger promotes creativity. Because anger mobilizes energy, arouses, and activates (Carver, 2004; Frijda, 1986; Klinger, 1975; Mowrer, 1960), it was predicted that anger potentially leads to more creativity than sadness, a deactivating mood state, and mood-neutral control states. Across four experiments (Study 3.1 – 3.4), anger indeed enhanced creativity more than sadness and mood-neutral control states but only initially – in the first blocks of time – and not in later phases of the creativity task. Furthermore, anger associated with a less structured approach to idea generation as compared to sadness (Study 3.1 and Study 3.2) and such unstructured thinking is relatively taxing. Indeed, these findings suggest that the relatively steep decline in creative productivity among angry individuals is due to resource depletion – angry people burn a lot of energy early on, which makes them relatively creative but also renders them fatigued faster than sad or mood-neutral people. Such fatigue shows up in substantially reduced creative performance at later stages. Accordingly, we found in Study 3.4 that,

following the taxing creativity task, angry participants reported being more depleted than sad individuals. Moreover, the relatively steep decline in creative performance among angry individuals was mediated by feelings of depletion. In short, the “wilder and more energetic” task-approach by angry compared to sad individuals pays off in initially higher levels of creativity, but because this approach is relatively taxing, energy resources get depleted, which results in reduced creativity especially in later phases. As such, these findings point to an important boundary condition to the general idea that activating mood states increase creativity, an issue that I return to below.

As said, it was observed that anger associated with a less structured approach to idea generation as compared to sadness. Specifically, we found less semantic clustering and more self-induced yet unstructured switching between cognitive categories among angry individuals than among their sad counterparts (Study 3.1 and Study 3.2). Thus, the initial work on anger and creativity by De Dreu and colleagues (2008) incorrectly inferred that anger promotes creativity because anger activates the individual to engage in persistent, focused, and effortful work—instead, anger arouses and activates but also triggers individuals to take a “wilder” approach to the creativity task. This fits the notion that the effects of anger on cognition are quite similar to those of happiness (Carver & Harmon-Jones, 2009; Lerner & Tiedens, 2006). Like happiness, anger might trigger the flexibility pathway, leading individuals to engage in cognitively flexible, loose, and unstructured processing with greater initial levels of creativity as a result.

### **Motivational Orientation, Activation, and Creativity**

Chapter 4 examined how motivational orientations and specific mood states associate with one another, and how they promote or inhibit creative performance. Recent work on motivational states and creativity has suggested that approach related states (induced by performing approach behavior, or being elated or frustrated) result in more global, inclusive and flexible thinking and greater creativity than avoidance related states (induced by performing avoidance behavior, or measured as chronic tendencies in trait anxiety; Chapter 2; Friedman & Förster, 2000, 2002). However, according to DPCM, any state or trait that activates rather than deactivates the individual promotes creative fluency and originality either through enhanced cognitive flexibility or through enhanced cognitive persistence – and indeed, experimentally induced activating and avoidance-related mood states,

such as fear and anxiety, have been found to promote creative performance (e.g., De Dreu et al., 2008).

A possible solution to this apparent conundrum lies in what I refer to as regulatory success – is the desired end-state achieved or not? Approach states activate the individual because the desired end-state is not attained and frustration and annoyance signals additional effort is needed, or because the desired end-state is achieved and the concomitant joy and elation activates in and of itself. Avoidance states activate the individual as long as the undesirable end-state is not successfully avoided; but when successfully avoided, the individual experiences relief, is deactivated and disengaged. Accordingly, in four experiments the basic hypothesis was tested that in the case of regulatory failure, both approach and avoidance oriented individuals would show high levels of creative fluency, originality, and insight performance; in case of regulatory success, however, avoidance oriented individuals were expected to show lower levels of creativity than those with an approach orientation.

The results of four studies confirmed this basic prediction and showed that directly induced feelings associated with unsuccessful avoidance (i.e., fear) led to more creativity than directly induced feelings associated with successful avoidance (i.e., relief; Study 4.2). Moreover, in the case of regulatory failure, avoidance-oriented individuals produced similar levels of creativity as approach-oriented individuals. However, in the case of regulatory success, avoidance-oriented individuals produced lower levels of creativity than those with an approach orientation (Study 4.1, 4.3, and 4.4). Finally, this effect was mediated by self-reported activation (Study 4.3 and 4.4). Thus, the results across all four studies show that greater originality and more creative insights emerge when the individual is activated and engaged, regardless whether the motivational orientation is towards approach or towards avoidance.

I also found new support for the idea that creativity can be achieved through enhanced cognitive flexibility and/or enhanced cognitive persistence. Consistent with earlier findings by De Dreu and colleagues (2008), Study 4.2 showed that fear led to greater creative fluency than relief through cognitive persistence (i.e., within-category fluency), and not through cognitive flexibility (the number of semantic categories that was assessed). In addition and consistent with earlier findings (De Dreu et al., 2009; Förster et al., 2004), Study 4.4 showed that approach-related states led to the use of more mental categories in a brainstorming task (i.e., flexibility) than avoidance-related states. However, and inconsistent with the idea



that avoidance-related states lead to a narrow processing style focused on details (i.e., persistence; Study 4.2; Derryberry & Reed, 1998), this effect was further qualified by regulatory success. Thus, avoidance-oriented individuals in the regulatory failure condition showed comparable levels of flexibility to those in the approach conditions; only individuals in the successful avoidance condition appeared to be less flexible. Moreover, because of this decreased flexibility, the successful avoidance condition (vs. the unsuccessful avoidance and approach conditions combined) led to lower levels of fluency and originality. Further below, I will outline some possible explanations as to why this is the case (see *Moods, Minds, Motives, and Creativity*).

### **Overall Conclusion**

In the introduction of this dissertation, I posed the question: Which moods make us creative and why? Previous accounts suggested that positive moods lead to greater creativity than negative and mood-neutral states, because positive moods are associated with greater flexibility (Ashby et al., 1999; Lyubomirsky et al., 2005; Murray et al., 1999). From the results of the current dissertation, it can be concluded that the mood-creativity relationship cannot be understood simply in terms of hedonic tone. Although happiness was associated with greater creativity, a relaxed state, another positive mood, was not (Chapter 2, De Dreu et al., 2008). It was also found that some negative moods, such as anger, led to similar levels of creativity as happiness (Chapter 2, De Dreu et al., 2008) and some negative moods, such as anger and fear, led to greater creativity than the positive moods relief and a relaxed state (Study 4.2, De Dreu et al., 2008). In short, an explanation of the mood-creativity relationship in terms of hedonic tone is difficult to maintain.

In our initial work, we suggested that activating moods would stimulate creativity as compared to deactivating moods and mood-neutral control states (DPCM, De Dreu et al., 2008). The results of the current dissertation clearly support this idea. Happiness was associated with greater creativity than relaxed moods and mood-neutral control states (Chapter 2, De Dreu et al., 2008) and anger led to more (early) creativity than sadness and mood-neutral control states (Chapter 3; De Dreu et al., 2008). The exception to this “activation-effect” was that individual differences in anxiety, another activating mood, related negatively to creativity (see Chapter 2). However, measures of trait anxiety reflect a propensity to perceive threatening objects and situations and this proneness to anxiety associates with vigilance and increased arousal only when threats are present or mentally activated (Heller et al.,

1997). In the absence of threat, the behavioral avoidance system is at rest and little activity and activation is expected. I suspect this is the reason why individual differences in anxiety relate negatively to creativity. Only when fear is aroused by imagery or in the presence of stressful threatening conditions, creativity is enhanced – indeed, Study 4.2 showed that fear, as aroused by imagery, led to greater fluency and originality than relief (see also De Dreu et al., 2008). Thus, mood states enhance creative performance when they are activating rather than deactivating. Moreover, because deactivating moods (e.g., relaxed state, sadness) were consistently unrelated to creativity as compared to mood-neutral states (Chapter 2), it is most likely that activation stimulates creativity rather than that deactivation undermines it.

Our findings on the role of motivational orientations in creativity further attest to the generalizability of the idea that some cognitive activation is needed for creativity to come about. Compared to deactivating motivational states (e.g., successful avoidance), activating motivational states (e.g., unfulfilled avoidance related states, and approach related states) led to greater levels of creative performance. Moreover, this effect was mediated by feelings of activation (Study 4.3 and 4.4). Supporting DPCM, it was thus found that any trait or state that activates and engages the individual stimulates creativity. An important implication that can be derived from these findings is that the extent to which states, traits, or circumstances are activating and engaging determines the likelihood that creativity is promoted. For example, because activation and engagement increases when a certain trait or (mental) state fits with the requirement of the (creativity) task (Higgins, 2005; Martin et al., 1993), we may infer that fit (vs. non-fit) promotes creativity. As a case in point, this interesting possibility is discussed more fully below.

I also asked a second question: How do activating moods and motivational states exert their effects? Consistent with DPCM, it appears that some activating states may have their creativity enhancing effects primarily because of increased flexibility and others primarily through increased persistence. Happiness and approach-related states enhance creativity primarily through increased flexibility (Study 4.4; see also De Dreu et al., 2008; Förster et al., 2004; Hirt et al., 2008) and findings from Chapter 3 point to the possibility that this might also be the case for anger. Fear, on the other hand, is associated with reduced cognitive flexibility (Chapter 2) and promotes creativity primarily through increased persistence (Study 4.2; see also De Dreu et al., 2008).

Taken together, DPCM received new support in that creativity can be achieved through different routes - cognitive flexibility or cognitive persistence, but an important issue is what determines which route is engaged? In our earlier work, hedonic tone and level of activation were put forward as critical dimensions underlying the mood-creativity relation, with activating moods stimulating creativity through flexibility when tone is positive and through persistence when tone is negative (De Dreu et al., 2008). However, consistent with work on motivational orientation and processing modes (Förster et al., 2004, 2006), current findings suggest that activating mood states stimulate creativity primarily through flexibility when the motivational orientation is towards approach and primarily through persistence when the motivational orientation is towards avoidance. To find out how mood states promote or inhibit flexibility, persistence, and creativity, below I examine how specific mood states, motivational orientations, and feelings of pleasure and activation associate with one another.

### **Activation From Fit**

As has been shown in the previous section, creativity is enhanced when people are activated and engaged while performing a creativity task. Because such activation and engagement is more likely when a certain trait or (mental) state fits with the requirement of the (creativity) task (Higgins, 2005; 2006; L. L. Martin et al., 1993), it follows that fit (vs. non-fit) may promote creativity. For example, grounded in the mood as input model (L. L. Martin & Stoner, 1996; see also Schwarz & Clore, 1983; 2007), it has been argued that the problem signal elicited by negative moods motivates to explore and solve problems or to invest more effort in order to meet performance standards. In corresponding fashion, the safety signal elicited by positive affect motivates to seek stimulation and to pursue incentives, activities that would be ill advised under less benign circumstances (Friedman et al., 2007). By implication, whereas participants in a negative mood benefit from a task that is framed as serious, and in which performance standards and extrinsic rewards are emphasized, those in a positive mood benefit from a task that is framed as funny and in which enjoyment and intrinsic rewards are emphasized (Hirt et al., 1996, 1997; L. L. Martin et al., 1993). In the meta-analysis (see Chapter 2), studies were coded as being serious or involving performance standards versus as being silly and fun or involving enjoyment standards. It was found that when the creativity task was framed in terms of fun and enjoyment, participants in a happy 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).

In a similar vein, individuals with stronger approach tendencies show a preference for flexible and inclusive thinking and global (as opposed to local) processing of information (Förster, 2009; Förster & Higgins, 2005; Semin, Higgins, De Montes, Estourget, & Valencia, 2005). Focusing on individual differences in approach tendencies, we reasoned that individuals with stronger approach tendencies would prefer a global processing mode and should consequently experience greater activation and engagement when a global rather than a local processing mode is externally induced (De Dreu et al., 2009). In turn, activation and engagement were expected to drive effects on creative performance. These predictions were tested and supported in four experiments.

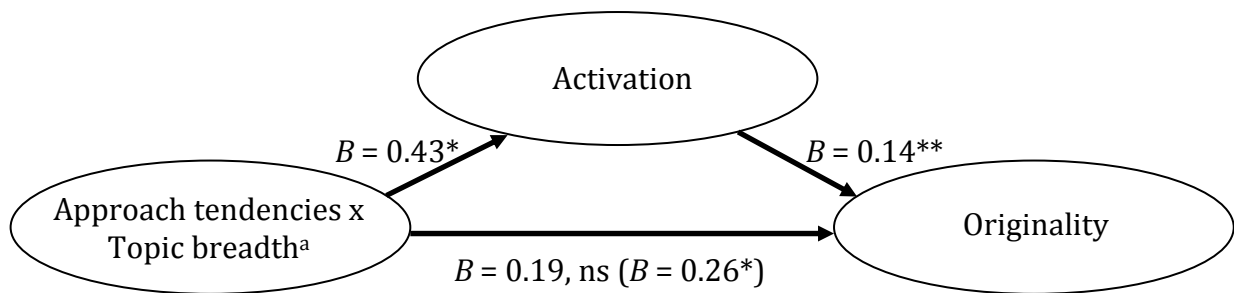


Figure 5.1. Mediation of the Interaction among Approach Tendencies and Topic Breadth on Originality by Activation

Note. <sup>a</sup>Narrow topic = 0; Broad topic = 1.

\*  $p < .05$ .      \*\*  $p < .01$ .

For example, one factor within ideation tasks is topic breadth. When generating ideas on a broad topic, one can benefit from flexibility, and generate ideas in categories that are not commonly considered. With a narrow topic, this is not possible and a local processing mode is expected to show a better match. Accordingly, we predicted that stronger approach tendencies would lead to higher originality when working on a broad topic, but not when working on a narrow topic (De Dreu et al., 2009, Study 4). Further, this interaction was predicted to be mediated by self-reported activation and engagement. Results supported predictions. As can be seen in Figure 5.1, stronger approach tendencies were positively related to originality, but only in the broad topic condition; stronger

approach tendencies were negatively related to originality of ideas for people working on a narrow topic. Moreover, the interaction between strength of approach tendencies and topic breadth on originality was mediated by self-reported activation. Thus, when task demands fit individual differences in approach tendencies, people experience more activation and engagement, and are more creative as a consequence. Taken together, the meta-analysis and a new series of studies showed that when a certain mood or motivational orientation fits with the requirement of the (creativity) task, people become more activated and engaged in the task and are therefore more creative.

### **The Interplay Between Hedonic Tone, Activation, and Motivational Orientation**

Although there is strong evidence for the association between mood states and specific motivational orientations (Carver, 2004; Frijda, 1986; Higgins, 2006; Idson et al., 2000; Mowrer, 1960), it is a relatively new development in the literature on mood and emotion to link a mood state's motivational orientation to cognitive activation, information processing modes, and creativity. Therefore, another central aim of this dissertation was to examine how specific mood states and motivational orientations associate with one another, and to find out how they promote or inhibit flexibility, persistence, and creative performance in general. As will be discussed below, this has important implications for our understanding of the ways mood influence creativity.

Specific moods and feelings of activation and pleasure are closely associated with motivational orientations (approach vs. avoidance) and regulatory success – is the desired end-state achieved or not? When the individual is moving towards, or anticipates aspired goals and positive outcomes, the motivational orientation is towards approach. In case of regulatory failure (i.e., lack of progress or outright failure to achieve one's goals), the individual is likely to experience negative emotional states such as anger, frustration, and disappointment that activate the individual to remedy the situation;<sup>20</sup> in case of regulatory success (i.e., successful goal attainment, good progress towards goal attainment), the individual is likely to experience positive and activating emotional states such as joy, happiness, and elation (see also Study 4.1). When the individual is moving away from, or anticipates aversive goals and negative outcomes, the motivational orientation is towards

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<sup>20</sup> Of course, prolonged failure to reach desired end-states or to avoid aversive end-states will eventually deactivate and lead to depression, disengagement and helplessness (Dweck, 1975). Indeed, although sad and depressed feelings might associate with an approach orientation (Carver, 2004; Higgins, 1997), they also deactivate and lead to disengagement.

avoidance. In case of regulatory failure, the individual is likely to experience negative and activating emotional states such as fear, anxiety, and worries; in case of regulatory success, the individual is likely to experience positive and deactivating emotional states such as relief, serenity, and calmness (see e.g., Study 4.1; Carver, 2004; Carver & Scheier, 1981; Higgins, 1997; Mowrer, 1960). In other words, in case of regulatory failure, the individual feels negative (vs. positive) and at the same time, failure activates and energizes the individual to remedy the situation, regardless whether the motivational orientation is towards approach or towards avoidance. In case of regulatory success, the individual experiences positive (vs. negative) feelings. However, in case of successful approach, the concomitant joy and elation activates in and of itself, whereas in the case of successful avoidance, the individual experiences relief, is deactivated and disengaged. And indeed, it was found in Chapter 4 that avoidance oriented individuals in the regulatory success condition were less active and engaged than the individuals in the successful approach condition and both regulatory failure conditions (Study 4.3 and Study 4.4).

Across time and situations, individuals experience specific emotional states and feelings of pleasure and activation as a result from regulatory success and failure in approaching desired end-states and in avoiding aversive end-states. This suggests that across time and situations, they come to associate specific emotional states with specific motivational orientations and regulatory success (cf., Burke et al., 1989; Fishbach & Labroo, 2007). For example, happiness comes to be associated with the tendency to actively approach and promote (see also Fredrickson, 2001; Frijda et al., 1989; Izard & Ackerman, 2000; Roseman et al., 1994) and fear comes to be associated with the tendency to actively avoid and prevent (Davidson et al., 2000; LeDoux, 1995). And indeed, Study 4.2 shows that fear is associated with successful avoidance (i.e., regulatory success in the case of avoidance motivation) to a lesser extent than relief. I suspect that being in a specific mood state entails feeling pleasurable or not, and feeling activated or not, because these feelings intrinsically associate with motivational orientations and regulatory success.

With regards to the determinants of creativity, the present dissertation shows that self-reported “hot” feelings such as relief and cheerfulness are less important in predicting creativity than motivational orientation, regulatory success, and activation. In none of the four studies in Chapter 4, it was found that self-reported feelings mediated the effects of our manipulations on creativity. Instead, Study 4.2 shows that fear produced greater creative fluency than relief because fear associates with successful avoidance to a lesser extent than relief. To my knowledge, this is first

time evidence that it is a mood states' association with motivational orientation and regulatory success that is driving creativity. Moreover, when motivational orientation and regulatory success were directly manipulated, approach-oriented individuals in the regulatory success condition and approach and avoidance-oriented individuals in the regulatory failure condition were more activated and engaged than avoidance oriented individuals in the regulatory success condition with enhanced creative performance as a consequence (Study 4.3 and Study 4.4). Together, these results show that "hot" somatic components have no effects on creativity and they suggest that earlier findings of mood on creativity need to be understood in terms of the interaction between motivational orientation and regulatory success and the concomitant feelings of activation.

With regards to the question how creativity is achieved, it has been argued and shown that approach related states engender a broad and global attentional scope and facilitate conceptual access to mental representations with lower a priori accessibility (i.e., flexibility), whereas avoidance related states engender a narrow attentional scope and a focus on local perceptual details (i.e., persistence; see e.g., Study 4.4; De Dreu et al., 2009; Derryberry & Tucker, 1994; Förster et al., 2006; Friedman & Förster, 2005a, 2008). This leads to the possibility that activating mood states that associate with an approach orientation might achieve their creativity-enhancing effects through increased flexibility, whereas activating mood states that associate with an avoidance orientation might achieve their creativity-enhancing effects through increased persistence. Indeed, approach-related activating moods, such as happiness and joy, have been shown to increase creativity because of greater flexibility (De Dreu et al., 2008; Hirt et al., 2008; Murray et al., 1990) and anger, another activating approach-related mood state, has been found to associate with unstructured switching between cognitive categories (Study 3.1 and Study 3.2). Additionally, avoidance-related activating moods, such as fear, have been shown to increase creativity because of greater persistence (Study 4.2; De Dreu et al., 2008).

A central aim of the present dissertation was to examine how specific mood states, feelings, motivational orientations, and the extent to which they arouse and activate associate with one another and to find out how they promote or inhibit flexibility, persistence, and creative performance. Hedonic tone, or "hot" feelings of happiness and relief are far less important in determining the effects of creativity – these feelings merely are the experiential byproduct of the successful pursuits of approach and avoidance goals. As said, mood states that activate and engage the individual stimulate creative performance. I suspect that a mood state's associated

feelings of activation and arousal result from the interaction between a mood state's motivational orientation (approach vs. avoidance) and regulatory success (vs. failure). This, in turn, drives effects on creativity with activating approach-related mood states engaging the flexibility pathway and activating avoidance-related mood states primarily engaging the persistence pathway. However, more research is clearly needed to substantiate this claim.

### **Boundaries, Limitations, and Future Directions**

#### **Resource Depletion: Energizing Pitfall for Creativity**

The present studies uncovered several important boundaries to the general pattern that activating mood states increase creativity: time on task, (un)structured thinking, and resource depletion. I found that angry individuals over time dropped substantially in creative performance whereas sad and mood-neutral individuals were able to maintain a more stable performance level (see Chapter 3). Grounded in the resource depletion literature, it was argued that being creative requires energy and as energy gets depleted, creative performance suffers. The less structured approach (i.e., more switching among categories) adopted by angry people requires more energy than the more systematic and structured approach adopted by those feeling sad (i.e., staying in semantic categories longer; Nijstad et al., 2003). Furthermore, aroused states, such as anger, mobilize energy to a greater extent than do deactivating states, such as sadness (Carver, 2004; Klinger, 1975), and draw more on cognitive as well as physical resources such as glucose (Blake et al., 2001). In short, the “wilder and more energized” task-approach by angry compared to sad individuals pays off in initially higher levels of creativity but requires energy which gets depleted and thereby reduces creativity especially in later phases.

That a more activating and unstructured task-approach also associated with faster resource depletion triggers some new questions. For example, fear and happiness trigger greater creativity than relieved, sad, and mood-neutral control states (Chapter 2, Study 4.2; De Dreu et al., 2008; Madjar & Oldham, 2002). This effect has been explained in terms of the higher levels of arousal and activation engendered by happiness and fear. However, whereas happiness, like anger, associates with the use of a less systematic and structured processing mode (Bless et al., 1990; Forgas, 1995; Mackie & Worth, 1989), fear associates with the use of a more focused, systematic, and analytical processing mode (De Dreu et al., 2008, Luu et al., 1998).



Current findings suggest that, like anger, the activating mood states fear and happiness promote creativity in early phases of the creativity task but, due to resource depletion, over time associate with more significant drops in performance than do deactivating states such as sadness and relaxation. However, because the less structured processing mode adopted by happy people requires more energy than the more systematic and structured approach adopted by those feeling fearful, the decline in creative performance for happy people might be stronger than for fearful people. In light of this, it is noteworthy that the meta-analysis (Baas et al., 2008) uncovered that the effects of happiness on creativity were weaker in creativity tasks of long rather than short duration (see also Kaufmann & Vosburg, 2002). Thus, it is possible that any activating mood state might be associated with resource depletion and lower levels of creativity later in a creativity task, especially when the mood state associates with unstructured information processing. New studies could examine a resource depletion account for the effects of happiness and fear on creative performance over time.

### **Moods, Minds, Motives, and Creativity**

DPCM proposes two routes towards creativity – flexibility and persistence – and in the present dissertation, I suggested that activating approach related states would stimulate creativity primarily through the flexibility route whereas activating avoidance related states would stimulate creativity primarily through the persistence route. Findings indeed showed that approach-related states that activate the individual (e.g., happiness, anger, unfulfilled and fulfilled approach conditions) stimulated creativity primarily through the flexibility route. However, whereas avoidance-related states that activate the individual sometimes stimulated creativity through the persistence route (as was the case for fear; Study 4.2; De Dreu et al., 2008) at other times stimulated creativity through the flexibility route (as was the case for unfulfilled avoidance; Study 4.4).

To solve this apparent conundrum, I propose that the strength of the avoidance state determines whether it is cognitive persistence, cognitive flexibility, or some combination that is activated. Consistent with the observation that the capacity for complex thinking is altered in a curvilinear fashion as arousal and activation increases (Broadbent, 1972; Yerkes & Dodson, 1908), it may be that low levels of arousal lead to inactivity, and low levels of cognitive flexibility and persistence (also De Dreu et al., 2008). At moderate levels of arousal, avoidance oriented individuals experience a strong impulse to improve the situation and will

be activated to consider multiple alternatives, to focus their attention on task relevant information, and to switch focused attention between different tasks (Cretenet & Dru, 2009; Koch et al., 2009; Robbins, 1984). Thus, moving from low to moderate levels of arousal and activation promotes both cognitive flexibility and persistence. At exceedingly higher levels of arousal, avoidance oriented individuals further increase their effort but in an exceedingly focused, almost narrow-minded and rigid manner (Derryberry & Reed, 1998; Friedman & Förster, 2008). In other words, moderate to strong levels of arousal should promote cognitive persistence as well as flexibility, but at excessively high levels of (avoidance oriented) arousal, increased persistence crowds out cognitive flexibility, with narrowed attention, rigid thinking, and the inability to modify ways of problem solving as the end-result (Pally, 1955; Staw et al., 1981). The above reasoning is consistent with the fact that persistence mediated effects of high arousing states (fear; Study 4.2; De Dreu et al., 2008) and that flexibility mediated effects of moderately arousing states (unsuccessful avoidance in the mouse-in-maze task; Study 4.4).

Similar processes might operate in the case of approach states. The idea would be that when moving from low to moderate levels of arousal, approach oriented individuals move from inactivity and disengagement to broad and global processing modes and flexible switching between perspectives and categories (Study 4.4; De Dreu et al., 2008, 2009; Hirt et al., 2008; Ashby et al., 1999). At excessively high levels of approach-oriented arousal, such flexibility may result in disinhibited processing of information and high distractibility (Dreisbach & Goschke, 2004). Thus, at excessively high levels of arousal and activation neither avoidance-oriented nor approach-oriented individuals would be expected to be very creative – the former because of rigidity of thought and the latter because of high distractibility. New research testing the effects of low-to-moderate-to high arousing avoidance and approach states is needed to conclude this issue.

### **Concluding Remarks**

Combining insights on moods, motivational orientations, creative processes, and basic regulatory principles, the research presented in this dissertation sheds new light on the mood-creativity relationship. It appears that the widespread belief that feeling positive or negative determines the effects of mood on creativity is incorrect. Instead, it was found that mood states that activate and engage the individual will enhance creativity, with activating approach-related moods exerting their effects primarily through flexible and inclusive thinking and activating

avoidance-related moods primarily having their effects through persistent and effortful probing. Current findings also suggest that activating mood states may have their creativity-enhancing effects especially in early phases of the creativity task but, due to resource depletion, over time associate with significant drops in performance.

How can the findings of this dissertation help managers, teachers, and parents to boost creativity in their employees, pupils, and children? Throughout this dissertation, it was found that creativity is enhanced most when the individual is engaged and activated. It was found that activating moods and motivational states (joy, anger, fear, unfulfilled avoidance, and approach states) produce more creativity than deactivating moods and motivational states (sadness, relaxed state, relief, and successful avoidance) and mood-neutral control states. Furthermore, people feel more activated and engaged when their mood or motivational orientation fits the requirements of the (creativity) task. These findings have important implications for practice. 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. In contrast, to promote creativity among employees, artists, scientists, or schoolchildren, inducing an activating state may be more fruitful – anger, fear, and happiness should be cherished, and sadness, relief, and relaxation should be frowned upon.

Furthermore, managers who seek to bolster creativity in their employees, school 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 the ways in which they frame their tasks and assignments to the mood and motivational tendencies their employees, pupils, and children have. For example, managers at Google value creativity as a positive outcome and allow their employees to spend 20 percent of their time to explore whatever ideas interest them most (Vise, 2005). Happy people with stronger approach tendencies are expected to excel under these flexible, enjoyable and interesting work conditions because they feel more activated and engaged. Managers from Google are thus recommended to hire people with stronger approach tendencies and to bring their employees in a happy mood by giving positive feedback and compliments, and by every now and then telling a funny story. 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.” However, when employees are feeling grumpy, when pupils are having a bad hair day, or when children are anxious, framing the task as serious and consequential to extrinsic rewards may actually help them to become engaged and activated and to elevate their level of creativity.

Managers, teachers, and parents are also advised to guard against resource depletion. Although the “energized” task-approach by individuals in activating states pays off in initially higher levels of creativity, this approach also draws upon energy, which gets depleted and thereby reduces creativity as time continues. To sustain creative output, energy resources should be replenished by allowing employees to have their sugared-coffee breaks, to have pupils eat healthy sandwiches, and by serving children a glass of lemonade.

Finally, it is important to note that creativity can be achieved through flexible, global, and divergent thinking and through systematic and persistent probing of a few categories and ideas. Help-books on creativity tend to focus exclusively on the flexibility pathway by highlighting the importance of “out-of-the-box,” lateral, and divergent thinking (De Bono, 1970), which is supposedly triggered by deactivated moods and minds (Brandsford & Stein, 1984). This pervasive viewpoint on how creativity is best achieved is also widespread among managers and entrepreneurs who think that creativity requires “loose,” “out-of-the-box,” and flexible thinking and is best achieved in a relaxed mood (Ten Hoopen & Janssen Groesbeek, 2008). The current findings indeed suggest that creativity can be achieved through flexible and divergent thinking. This, however, does not happen when one is deactivated and feels relaxed and calm – it happens when one is activated, feels happy, and is focused on desired outcomes. The same managers and entrepreneurs also believe that a systematic and thorough approach actually hinders creativity. In doing so, they fail to see the persistence pathway to creativity. It may take longer for creativity to come about, but given enough resources, the deliberate, persistent, and in-depth exploration of a few cognitive categories or perspectives may ultimately results in many and original ideas, products, and insights. As the famous scientist Isaac Newton said: “If I have ever made any valuable discoveries, it has been due more to patient attention, than to any other talent.”

In conclusion, I began this dissertation with several quotes and observations in which mood states were linked to the human capacity for creativity and I asked which quotes or observations were right – which moods do, and do not, promote creative insight and original thinking? From the findings of this dissertation, it can

be concluded that Dutch managers and entrepreneurs incorrectly believe that being relaxed stimulates their creativity (cf. ten Hoopen & Janssen Groesbeek, 2008) and Flemish writer Herman Brusselmans (n.d.) is certainly wrong when he says that all major discoveries are made by depressed people. Instead, the angry Nobel Prize laureate Max Perutz, the fictional and anxious creative advertisement director Don Draper, and the happy camper that is focused on positive outcomes all have a better intuition of the psychology of creativity: If you want to be creative, you need to be activated.