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| File ID | 164732 |
| Filename | Chapter 4: When avoidance motivation promotes creativity : the role of motivational orientation and regulatory success |

SOURCE (OR PART OF THE FOLLOWING SOURCE):

| | |
|---|---|
| Type | Dissertation |
| Title | The psychology of creativity : moods, minds, and motives |
| Author | M. Baas |
| Faculty | Faculty of Social and Behavioural Sciences |
| Year | 2010 |
| Pages | 194 |
| ISBN | 978#90#76269#80#1 |

FULL BIBLIOGRAPHIC DETAILS:
http://dare.uva.nl/record/331701

CHAPTER 4

# When Avoidance Motivation Promotes Creativity: The Role of Motivational Orientation and Regulatory Success

Approach states generally boost creativity because they associate with activating moods and enhanced cognitive flexibility. With regards to avoidance states, research evidence is less consistent, with some findings suggesting avoidance states promote creativity and other findings pointing to no or even negative effects. We propose and test the hypothesis that whether avoidance states boost creativity depends on regulatory success, the sense of success or progress towards fulfilling a goal. Therefore, we predicted that avoidance states that activate the individual (unfulfilled avoidance motivation, fear) lead to similar levels of creativity as approach states, but that avoidance states that deactivate (successful avoidance, relief) lead to lower levels of creativity. Moreover, we predicted this effect would be mediated by feelings of activation. Results supported predictions. Implications for motivation, mood, and creativity are discussed.

Chapter based on Baas, M., De Dreu., C. K. W., & Nijstad, B. A. (2009b). When avoidance motivation promotes creativity: The role of motivational orientation and regulatory success. *Manuscript under review.*

Behavior, motivation, and emotions are regulated by two fundamental biobehavioral systems: approach and avoidance (e.g., Cacioppo et al., 1999; Davidson et al., 1990; Elliot & Thrash, 2002; Gray, 1990; Higgins, 1997; Lang et al., 1990; Watson et al., 1999). The approach system facilitates appetitive behavior, usually generated in the context of moving towards aspired goals, such as acquiring or consuming desired objects. It associates with cheerfulness (happiness, joy, elation) that results from good progress towards and successful achievement of a desired end-state, or with dejection-related negative emotions such as disappointment and frustration that result from failure to (proceed towards) achieving the desired end-state (Carver, 2004; Carver & Harmon-Jones, 2009; Higgins, 1997; Idson et al., 2000; Izard & Ackerman, 2000; Mowrer, 1960). The avoidance system facilitates inhibitory behavior, usually generated in the context of moving away from aversive stimulation and rejecting and avoiding aversive end-states. It associates with quiescence-related emotions, such as relief and feeling relaxed, in the case of regulatory success, or with fear, tension, and worry in case of regulatory failure (Carver, 2004, 2009; Frijda, 1986; Higgins, 1997; LeDoux, 1995; Mowrer, 1960).

In recent years, these motivational and affective processes have been connected to the human capacity for creativity and innovation – the ability to generate ideas, insights, and solutions that are new and potentially useful (Amabile, 1996; Runco, 2004). Specifically, it has been argued and shown that approach-oriented individuals engage in more global, inclusive, and flexible thinking, and are thus more creative than avoidance-oriented individuals (e.g., Friedman & Förster, 2000, 2001, 2002). Likewise, it has been argued and shown that happy individuals take broader and more flexible approaches (Fredrickson & Branigan, 2005; Murray et al., 1990), allowing them to be more creative than individuals in mood-neutral control conditions or individuals feeling sad (e.g., Ashby et al., 1999; Baas et al., 2008). One possible link between these two sets of findings is that happy individuals have stronger approach tendencies than mood-neutral controls and sad individuals (Baas et al., 2008). However, this explanation remains untested. Moreover, it appears inconsistent with the finding that whereas avoidance orientations are not or negatively related to creativity (Friedman & Förster, 2000, 2002), avoidance-related mood states such as fear and anxiety can promote creative performance (Clapham, 2001; De Dreu et al., 2008). In short, the interplay between motivational orientation, specific mood states, and creative performance remains poorly understood.

The present work seeks to further understanding of how motivational orientations and specific mood states associate with one another, and how they promote or inhibit creative performance. Whereas our studies involve both approach and avoidance orientations, we focus on avoidance orientation and its related moods such as fear and anxiety because it is these facets that remain least investigated and understood. We invoke the Dual Pathway to Creativity Model (Baas et al., 2008; De Dreu et al., 2008), and propose that especially in the case of avoidance orientation, regulatory success is vital: successful avoidance is associated with relief and deactivates, whereas unsuccessful avoidance is associated with anxiety and activates. The extent to which the individual is activated in turn drives creative performance. We tested (facets of) this prediction in two studies on creative insights, and two on idea generation.

## Dual Pathway to Creativity Model

Creativity is commonly defined as the generation of ideas, insights, and solutions that are both novel and potentially useful (Runco, 2004). The hallmark of creativity is originality – an idea, insight or solution is original when it is infrequent or uncommon (Amabile, 1996; Guilford, 1967). In addition to originality, creativity researchers often look at fluency – the number of unique ideas, insights, and solutions an individual generates (e.g., Simonton, 1997; Torrance, 1966). Fluency and originality may be correlated (as in the adagio that "quantity breeds quality," Osborn, 1953; see also Simonton, 1997), but they need not to be – someone may generate only one idea or insight that is highly original, or many ideas or insights only some of which are original.

According to the Dual Pathway to Creativity Model (DPCM; Baas et al., 2008; De Dreu et al., 2008; De Dreu, Nijstad, & Baas, 2009; Rietzschel et al., 2007a; see also Boden, 1998; Hirt et al., 2008) originality and fluency can be achieved through enhanced cognitive flexibility, enhanced cognitive persistence, or some combination of the two. The "flexibility pathway" entails flexible thinking, relying on broad and inclusive cognitive categories, and global (as opposed to local) processing of information (Förster, 2009). It involves "set-breaking" (e.g., Knoblich et al., 1999; Ormerod et al., 2002; S. M. Smith & Blankenship, 1991) and requires flat and global associative hierarchies (e.g., Eysenck, 1993; Förster et al., 2004; Mednick, 1962) to arrive at many and uncommon ideas, insights, and associations. Alternatively, originality and fluency can be achieved through persistent probing and hard work – solving problems and generating novel ideas and insights can be achieved through

prolonged and motivated effort (Amabile, 1996; Eisenberger & Rhoades, 2001; Fodor & Carver, 2000), and focused and systematic exploration of a few possible solutions and perspectives (Rietzschel et al., 2007b). Indeed, the best predictor of creative eminence is (quantitative) productivity (Simonton, 1997).

Whether the flexibility and/or persistence pathway is engaged, depends, according to DPCM, first and foremost on the extent to which the individual is activated. First, being activated leads to task engagement and motivation to consider the issue at hand (Brehm, 1999; Broadbent, 1972; Dietrich, 2004). 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; Gray, 1982; Robbins, 1984). In other words, cognitive activation and engagement is needed to activate both the cognitive flexibility and persistence pathway, thereby stimulating creativity. Indeed, in their study on the effects of specific mood states, De Dreu and colleagues (2008) found that activating and engaging mood states such as fear, anger, and joy cause more creativity than deactivating mood states, such as sadness or feeling relaxed.

**Motivational Orientation and Creativity Revisited**

From DPCM it follows that both approach and avoidance states promote creativity to the extent that these motivational states arouse and cognitively activate the individual. However, this is not what research on approach and avoidance seems to show. Quite to the contrary, ample evidence exists that approach relative to avoidance states lead to more originality and insights because of enhanced flexibility and global (as opposed to local) processing of information (for reviews see Baas et al., 2008; Friedman & Förster, 2008). For example, Friedman and Förster (2000, 2002, 2005b) manipulated motivational states by asking participants to perform approach behavior (pulling a lever towards them), or avoidance behavior (pushing a lever away), and subsequently had them perform creativity tasks. Results showed that approach behaviors indeed produced more cognitive flexibility and originality, and greater insight problem solving than avoidance behaviors. Focusing on individual differences in approach tendencies (versus avoidance tendencies), De Dreu et al. (2009) found that whereas individual differences in approach tendencies could be linked to enhanced task engagement and creativity, avoidance tendencies were consistently not related to task engagement or creative performance. Finally,

in their meta-analysis on the relationship between mood and creativity, Baas and colleagues (2008) found that mood states typically associated with approach orientation (e.g., happiness, anger) more strongly related to creativity than moods, such as fear and anxiety, that are typically associated with avoidance orientation.[14]

A possible solution to this apparent conundrum lies in what we refer to as regulatory success – is the desired end-state achieved or not? Unfulfilled goals remain activated and motivation to goal fulfillment is maintained (Förster, Liberman, & Higgins, 2005; Zeigarnik, 1927). Both in case of avoidance and approach states, lack of progress or outright failure to achieve one's goals result in enhanced activation, effort, and persistence (Brown & Jacobs, 1949; Carver, 2004; De Dreu et al., 2008; Förster, Grant, Idson, & Higgins, 2001; Frijda, 1986; Idson & Higgins, 2000; Mowrer, 1960). It also induces mood states signaling regulatory failure (Carver & Scheier, 1981; Mowrer, 1960). Failure to proceed or attain a desirable end-state results in frustration, anger or disappointment. Failure to move away from an undesirable end-state results in fear and anxiety (Carver, 2004; Higgins, 1997; Mowrer, 1960). Frustration, anger, fear, and anxiety all signal that more effort and motivation is needed toward goal fulfillment and indeed, fear, tension, anger, and frustration are emotional states that activate and engage the individual (Carver, 2004; Frijda, 1986; Izard & Ackerman, 2000; Watson et al., 1999). In other words, regulatory failure is activating and engaging, regardless whether the motivational orientation is towards approach or towards avoidance.[15]

Whereas regulatory failure activates and energizes, regulatory success is likely to have different effects in the case of approach than avoidance orientation. If the individual is focused on approaching desired end-states, regulatory success results in enhanced effort and persistence (Förster, Higgins, & Idson, 1998; Förster et al., 2001; Idson & Higgins, 2000; Van Dijk & Kluger, 2004). Indeed, the joy, happiness, and elation typically associated with the successful attainment of desired end-states are mood states that activate and arouse the individual (e.g., Barrett & Russell, 1998; Watson et al., 1999). However, if the individual is focused on avoiding aversive end-states, regulatory success lowers activation, effort and persistence

[14] It is important to note that in contrast to approach-related moods, which were oftentimes experimentally manipulated, avoidance-related moods, without exception, were measured as chronic tendencies (e.g., with the STAI, Spielberger, Gorsuch, & Lushene, 1970). Consequently, this meta-analysis does not allow conclusions about the causal impact of avoidance-related moods.

[15] 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).

(Brown & Jacobs, 1949; Carver, 2004; Förster et al., 2001; Frijda, 1986; Idson & Higgins, 2000; Mowrer, 1960). Indeed, the relief typically associated with successful avoidance of aversive end-states deactivates and promotes disengagement (Carver, 2004, 2009; Frijda, 1986; Mowrer, 1960). Relief signals that energy resources should be restored and replenished after a successful escape or when an anxious situation is resolved (Fredrickson et al., 2000; Frijda, 1986). In other words, successful approach is activating but successful avoidance is deactivating.

## The Present Studies: Overview and Basic Hypothesis

According to DPCM, any state or trait that activates rather than deactivates the individual promotes creative fluency and originality either through enhanced cognitive flexibility, enhanced cognitive persistence, or some combination. 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, our basic hypothesis is that in the case of regulatory failure, both approach and avoidance oriented individuals show high levels of creative fluency, originality and insight performance; in case of regulatory success, however, avoidance oriented individuals show lower levels of creativity than those with an approach orientation (Hypothesis 1). This basic prediction was tested in four studies, two focusing on conceptual insight performance (Study 4.1 and 4.3) and two focusing on idea generation (Study 4.2 and 4.4). Additionally, we examined whether feelings of activation and/or specific mood states mediated this effect, and whether the effect was mediated by persistence or flexibility. Specific additional hypotheses will be given when introducing each study.

## Study 4.1

Study 4.1 was set up to directly examine the interaction between motivational orientation and regulatory success. We predicted that in the case of regulatory failure, both approach and avoidance oriented individuals would show high levels of creativity; however, in the case of regulatory success, avoidance oriented individuals were expected to show less creativity than approach oriented individuals (Hypothesis 1). We further measured participants' moods, to see whether mood states mediated this effect. We expected no such mediation, because

goal states are activating by themselves and need not be associated with mood states to have their effects on creative performance (see also Friedman & Förster, 2005b).

**Method**

*Design and participants*. Undergraduate students (*N* = 95, 73% female) with a mean age of 20.1 years (*SD* = 3.5) participated for partial fulfillment of a course requirement and were randomly assigned to one of four different conditions that were obtained by varying motivational orientation (approach vs. avoidance) and regulatory success (goal attainment vs. not). Dependent variables were the number of correctly solved insight problems, and self-reported ratings of relief and cheerfulness.

*Procedure, manipulations, and creativity task.* Participants were seated behind a personal computer, which displayed all materials and registered responses to questions. Participants were asked to participate in two different and independent studies, one about autobiographical memory (the task used to manipulate motivational orientation and regulatory success), and the other a verbal performance task. Participants were then asked to write down their gender and age, and to write a short essay about a situation that happened to them. In the approach condition, they were asked to write about a situation in which they successfully approached a positive outcome (successful goal attainment) or were unsuccessful in approaching a positive outcome (unsuccessful goal attainment); in the avoidance condition, they were asked to write about a situation in which they successfully avoided a negative outcome (successful goal attainment) or were unsuccessful in avoiding a negative outcome (unsuccessful goal attainment). They were specifically asked to write their essay in such a way that another person could imagine the situation they were in.

Upon completion of the "autobiographical memory task", participants continued with 30 items of the Remote Associates Test (RAT; Mednick, 1962) that were presented in random order. The RAT assesses the ability 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. Following the RAT, participants answered a short questionnaire, were debriefed, and dismissed.

*Dependent variables.* We coded the number of correctly solved RAT problems (range between 0 and 30). Furthermore, participants indicated their current mood on a Likert scale ranging from 1 (not at all) to 5 (very much). As a measure of relief, we asked participants to rate how relieved [anxious, fearful; reverse coded] they felt ($\alpha$ = .88). As a measure of cheerfulness, we asked how eager, joyous [dissatisfied; reverse coded] they felt ($\alpha$ = .68).

**Results**

*RAT performance*. We submitted the number of solved RAT problems to a 2 (motivational orientation) x 2 (regulatory success) ANOVA. Cell means are given in Table 4.1. First, we obtained main effects of motivational orientation and regulatory success. Participants in the approach condition solved more problems ($M$ = 11.87) than participants in the avoidance condition ($M$ = 10.40), $F(1, 91) = 4.15$, $p < .05$; partial $\eta^2 = .04$. Participants in the unsuccessful attainment condition tended to solve more problems ($M$ = 11.81) than participants in the successful attainment condition ($M$ = 10.53), $F(1, 91) = 3.28$, $p = .07$; partial $\eta^2 = .04$. Both main effects were qualified by our predicted interaction between motivational orientation and regulatory success (Hypothesis 1), $F(1, 91) = 3.88$, $p = .05$; partial $\eta^2 = .04$. Contrast analyses revealed no difference in RAT performance between unsuccessful approach and unsuccessful avoidance conditions, $F < 1$. However, participants in the successful avoidance condition solved fewer problems ($M$ = 8.94) than participants in the successful approach condition ($M$ = 11.95), $F(1, 91) = 6.48$, $p = .01$; partial $\eta^2 = .07$.[16]

*Post-task mood states*. We submitted ratings of relief and cheerfulness to separate 2 (motivational orientation) x 2 (regulatory success) ANOVA's. Cell means are given in Table 4.1. ANOVA revealed a main effect of regulatory success on ratings of relief, $F(1, 91) = 11.78$, $p < .01$; partial $\eta^2 = .12$. Participants in the successful goal attainment condition reported more relief ($M$ = 4.36) than participants in the unsuccessful goal attainment condition ($M$ = 3.98). We also found an interaction among regulatory success and motivational orientation, $F(1, 91) = 3.89$, $p = .05$;

[16] RAT-problems vary substantially in difficulty and the RAT that was used in this study consists of 10 relatively easy, 10 moderate, and 10 relatively difficult problems (Mednick & Mednick, 1967). However, adding difficulty level to our analyses as a within-subjects variable did not change our results.

partial $\eta^2$ = .04. Table 4.1 shows that participants in the approach condition had similar ratings of relief regardless of regulatory success, $F < 1.8$, ns; however, participants in the successful avoidance condition reported stronger relief than participants in the unsuccessful avoidance condition, $F(1, 91) = 12.08$, $p < .01$; partial $\eta^2$ = .12.

For cheerfulness, we only found an interaction among regulatory success and motivational orientation, $F(1, 91) = 4.86$, $p < .05$; partial $\eta^2$ = .05. Table 4.1 shows that participants in the avoidance condition had similar ratings of cheerfulness regardless of regulatory success, $F < 1$; however, participants in the successful approach condition reported stronger cheerfulness than participants in the unsuccessful approach condition, $F(1, 91) = 10.25$, $p < .01$; partial $\eta^2$ = .10.

Table 4.1

*Means (Standard Deviations) for RAT Performance and Mood Ratings as a Function of Motivational orientation and Regulatory Success*

| | Successful approach *M* (*SD*) | Successful avoidance *M* (*SD*) | Unsuccessful approach *M* (*SD*) | Unsuccessful avoidance *M* (*SD*) |
|---|---|---|---|---|
| RAT performance | 11.95 (4.22) | 8.94 (3.68) | 11.83 (2.96) | 11.78 (3.28) |
| Relief | 4.21 (.45) | 4.53 (.44) | 4.03 (.60) | 3.87 (.65) |
| Cheerfulness | 3.54 (.63) | 3.22 (.74) | 2.98 (.68) | 3.28 (.49) |

*Mediation.* To test whether mood states mediate the effects on creative performance, we regressed the number of solved RAT items on cheerfulness and relief. For cheerfulness ($\beta$ = .09, $t < 1$, ns) and relief ($\beta$ = -.13, $t < 1.3$, ns), no significant regressions were observed. Thus, "hot" feelings did not mediate the effects of motivational orientation and regulatory success on creative insight performance. This is consistent with Friedman and Förster (2000, 2001) who also failed to find mood states to mediate effects of motivational orientation on creativity.

## Discussion and Introduction to Study 4.2

Study 4.1 shows that successful avoidance, but not unsuccessful, avoidance lowers creativity compared to approach states. This effect was not mediated by (self-reported) feelings of relief, a mood state typically associated with regulatory

success in the case of avoidance orientation (Carver, 2009; Mowrer, 1960). This suggests that it is the combination of motivational orientation and regulatory success more than the associated mood state that drives creativity. Put differently, when we directly induce feelings associated with unsuccessful (fear) versus successful avoidance (relief), we would expect to find more creativity in fearful than in relieved participants (Hypothesis 2), and this effect should be mediated by perceived regulatory success (Hypothesis 3). Testing these predictions was our first objective in Study 4.2.

Our second objective in Study 4.2 was to further our understanding of the pathways through which avoidance-related mood states influence creativity. Whereas fear tends to reduce cognitive flexibility (e.g., Baas et al., 2008; Derryberry & Reed, 1998; Mikulincer et al., 1990a), it tends to promote cognitive persistence (De Dreu et al., 2008; see also Verhaeghen et al., 2005). Accordingly, we predicted that regulatory success in the case of avoidance orientation (i.e., the relief condition) lowers creativity because regulatory success reduces cognitive persistence as compared to unsuccessful avoidance (the fear condition; Hypothesis 4). To be able to test this prediction, participants engaged in a brainstorm task, in which it is possible to directly assess both cognitive flexibility and cognitive persistence (see De Dreu et al., 2008; see also below).

**Method**

*Design and participants.* Thirty-two students (age $M$ = 19.5, $SD$ = 2.5; 8 male) received course credit and were randomly assigned to one of two mood conditions (fear/relief). Dependent variables were four measures of creativity (creative fluency, originality, cognitive flexibility, and persistence), and measures of regulatory success and relief.

*Procedure and independent variables.* Participants were asked write a short essay about a situation that happened to them and that made them feel really fearful [relieved]. They were asked to pay attention to the vivid emotional aspects of the situation and write their essay in such a way that another person could imagine the situation they were in. Upon completion of the mood manipulation task, participants continued with a brainstorming task about ways to improve and preserve the environment. Participants were asked to generate as many ideas as possible and to avoid (self) criticism and evaluation. Participants keyed in their ideas which were stored. After 4 minutes, participants read on the screen that the time to key in ideas

was over. Hereafter, they answered a short questionnaire, were debriefed, and dismissed.

*Dependent variables.* A trained rater who was blind to conditions coded the ideas, problem solutions, and suggestions that were generated by the participants. First, the rater counted the number of non-redundant ideas generated per participant. This was our measure of *creative fluency*. The same rater classified all non-redundant ideas to distinct semantic categories that cover the environment system (see Nijstad et al., 2003). A second rater coded a subset of 215 ideas (64 %). Agreement among raters was good (Cohen's κ = .79). Next, the number of non-redundant categories was counted for each participant as a measure of *cognitive flexibility* and *persistence* was operationalized as within-category fluency – the number of unique ideas divided by the number of categories from which these ideas were sampled (see De Dreu et al., 2008). Finally, originality of ideas was based on the relative infrequency of ideas. Ideas were considered original, and received a score of 1, if they were coded in categories that were used by 1 percent or less of the participants (Guilford, 1967; Torrance, 1966). This resulted in a total of 21 original ideas (11.0 %). We counted the number of original ideas per participant as a measure of *originality.*

Following Higgins (1997) and Carver (2004), *successful avoidance* (i.e., regulatory success in the case of avoidance orientation) was measured by asking participants to rate their autobiographical stories in terms of the extent to which these reflected an event that was about the successful avoidance of a negative outcome (1 = not at all, to 7 = very much). In order to do so, participants returned to their autobiographical story that they could go through before answering our successful avoidance measure. *Relief* was measured as in Study 4.1.

## Results

*Descriptive statistics.* Table 4.2 shows the means and standard deviations, along with the zero-order correlations for all study variables. It shows, first, strong positive correlations among the creativity measures fluency, originality, flexibility, and persistence. Second, fluency and flexibility correlated negatively with the extent to which the mood-related stories reflected an event that was about the successful avoidance of a negative outcome. Third, ratings of relief did not correlate significantly with any of the creativity measures.

Table 4.2

*Descriptive Statistics and Zero-Order Correlations*

| | *M*. | *SD*. | 1. | 2. | 3. | 4. | 5. |
|---|---|---|---|---|---|---|---|
| 1. Fluency | 5.97 | 3.35 | | | | | |
| 2. Originality | 0.66 | 0.94 | .51** | | | | |
| 3. Flexibility | 2.59 | 1.13 | .61** | .38* | | | |
| 4. Persistence | 2.45 | 1.43 | .50** | .12 | -.25 | | |
| 5. Successful avoidance | 4.44 | 2.29 | -.59** | -.08 | -.45** | -.23 | |
| 6. Relief | 4.02 | 0.52 | -.16 | -.10 | -.16 | -.16 | .14 |

*Note*. * $p < .05$. ** $p < .01$. ($N = 32$).

*Creativity.* Creativity measures (fluency, originality, flexibility, and persistence) were submitted to separate ANOVA's with mood as between-subjects factor. Predictions were supported. First, fearful participants generated more ideas ($M$ = 7.00, $SD$ = 3.40) than relieved participants ($M$ = 4.64, $SD$ = 2.87), $F(1, 30) = 4.33$, $p < .05$; partial $\eta^2 = .13$. Second, fearful participants were more original ($M$ = .94, $SD$ = 1.06) than relieved participants ($M$ = .29, $SD$ = .61), $F(1, 30) = 4.31$, $p < .05$; partial $\eta^2 = .13$. Finally, fearful participants were more persistent ($M$ = 2.99, $SD$ = 1.65) than relieved participants ($M$ = 1.76, $SD$ = .65), $F(1, 30) = 6.91$, $p < .05$; partial $\eta^2 = .19$, but they did not differ for cognitive flexibility, $F < 1$. These results support Hypothesis 2.

*Relief and successful avoidance.* ANOVA revealed a main effect of mood on ratings of relief, $F(1, 30) = 12.15$, $p < .01$; partial $\eta^2 = .29$. Relieved participants reported more relief ($M$ = 4.33, $SD$ = .51) than fearful participants ($M$ = 3.78, $SD$ = .40) indicating that our mood manipulation was successful. In addition, ANOVA revealed a main effect of mood on successful avoidance, $F(1, 30) = 6.30$, $p < .05$; partial $\eta^2 = .17$. Relieved participants indicated that their autobiographical story reflected successful avoidance to a greater extent ($M$ = 5.50, $SD$ = 1.65) than fearful participants ($M$ = 3.61, $SD$ = 2.40).

*Mediation tests*. To test for mediation, we computed a series of regression analyses along the criteria set forth by Kenny et al. (1998), in which we compared the effect of mood (fear set as 0 vs. relief set as 1) on creative fluency. As can be seen

in Figure 4.1, successful avoidance regressed significantly on mood ($\beta$ = .42, $t$ = 2.51, $p$ < .05). When we regressed the number of ideas on mood after controlling for successful avoidance, the originally significant effect of mood ($\beta$ = -.36, $t$ = -2.08, $p$ < .05) dropped to non-significance ($\beta$ = -.13, $t$ < 1, ns); the effect of successful avoidance was significant ($\beta$ = -.53, $t$ = -3.27, $p$ < .01). A Sobel-test confirmed that the mediation was significant, $Z$ = -1.99, $p$ < .05. Thus, supporting Hypothesis 3, relief produced lower levels of creativity than fear because it is associated more strongly with successful avoidance.

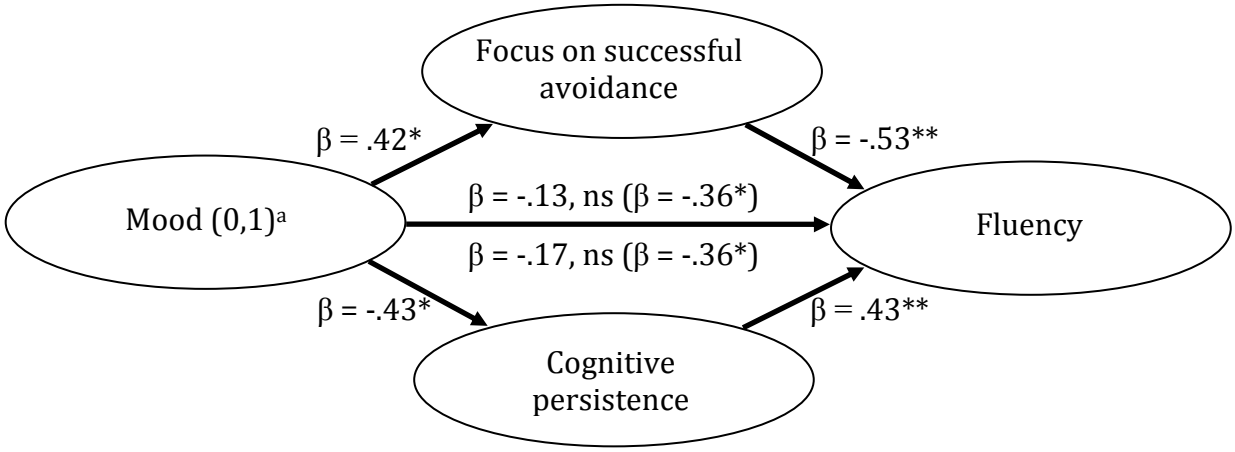


*Figure 4.1*. Mediation of the Effect of Mood on Creative Fluency by Successful Avoidance and Persistence

*Note.* [a]Fear = 0; relief = 1.

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

As can be seen in Figure 4.1, cognitive persistence regressed significantly on mood ($\beta$ = -.43, $t$ = -2.63, $p$ < .05). When we regressed fluency on mood after controlling for cognitive persistence, the originally significant effect of mood ($\beta$ = -.36, $t$ = -2.08, $p$ < .05) dropped to non-significance ($\beta$ = -.17, $t$ < 1, ns); the effect of cognitive persistence was significant ($\beta$ = .43, $t$ = 2.45, $p$ < .05). A Sobel-test confirmed that the mediation was marginally significant, $Z$ = -1.83, $p$ < .07. Thus, supporting Hypothesis 4, relief produced lower levels of creativity than fear because it reduces cognitive persistence. Finally, when we entered mood condition (1), successful avoidance (2), and persistence (3) in the regression model, both the effect of successful avoidance $\beta$ = -.51, $t$ = -3.44, $p$ < .01 and persistence were significant, $\beta$ = .40, $t$ = 2.68, $p$ = .01. This suggests that persistence and successful avoidance operate independently. No mediation effects were observed for originality.

## Discussion and Introduction to Study 4.3

Relief produced lower levels of creativity than fear. Together with findings from Study 4.1, Study 4.2 provided support for the idea that deactivating motivational states associated with successful avoidance (i.e., relief) lowers creative performance as compared to activating motivational states associated with unsuccessful avoidance (i.e., fear). Moreover, the extent to which the mood-related stories reflected regulatory success mediated this effect. To our knowledge, this is first time evidence that it is a mood states' association with motivational orientation and regulatory success that is driving creativity (cf., Baas et al., 2008; Friedman & Förster, 2005b). Interestingly, it is often assumed that positive moods lead to higher levels of creativity than negative moods (Lyubomirsky et al., 2005; Murray et al., 1990) but here a positive mood state (relief) actually led to lower levels of creativity than a negative mood state (fear).

Consistent with earlier findings by De Dreu and colleagues (2008), 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). This finding further supports DPCM in that it highlights that creativity can be achieved through either enhanced flexibility or enhanced cognitive persistence.

Our finding that avoidance orientations may promote creativity may appear inconsistent with earlier work by Friedman and Förster (2000, 2001, 2002) who found that relative to approach behavior, avoidance behavior decreased performance on creative insight and divergent thinking tasks. One way to reconcile this apparent discrepancy is to assume that these earlier studies compared approach versus avoidance orientations under regulatory success rather than failure. Indeed, it stands to reason that pushing a lever away or towards oneself is an easy task most healthy subjects can do. A similar observation applies to the mouse-in-maze task used by Friedman and Förster (2001, 2002) to manipulate motivational orientation. In this task, participants received on paper a cartoon mouse trapped in a maze and were instructed to find a way out of the maze. In the approach condition, a piece of cheese (gain) was lying outside the maze; in the avoidance condition an owl (threat) was depicted as hovering above the maze. Participants finished this maze task before moving to the creativity task, and thus were likely to experience regulatory success – they attained the cheese and, in the avoidance condition, found a safe haven the owl could not get to.

Our first objective in Study 4.3 was to examine the interaction between motivational orientation and regulatory success using this mouse-in-maze task, so as to enable reconciliation of our findings with those reported earlier by Friedman and Förster. We manipulated motivational orientation but altered the mouse-in-maze task to additionally manipulate regulatory success. We expected a replication of Friedman and Förster in the case of regulatory success, but similar levels of creativity among approach and avoidance motivated individuals in the case of regulatory failure (Hypothesis 1). A second aim was to test the assumption derived from the DPCM that motivational states have their effects on creativity because they either activate or deactivate. Thus, we measured the level of activation and tested whether activation mediated the interaction between motivational orientation and regulatory success (Hypothesis 5).

**Method**

*Design and participants*. Undergraduate students ($N$ = 77, 67% female) with a mean age of 20.7 years ($SD$ = 6.0) were randomly assigned to one of four different conditions that were obtained by varying motivational orientation (approach vs. avoidance) and regulatory success (goal fulfillment vs. not). Dependent variables were the number of solved RAT-items, and self-reported ratings of activation, relief, and cheerfulness.

*Procedure, manipulations, and creativity task*. Participants first engaged in the frozen-mouse task (a modified version of the mouse-in-maze task from Friedman & Förster, 2001) to manipulate motivational orientation and regulatory success. Participants saw a mouse trapped in a maze and were instructed to find a way out of the maze with the aid of their computer-mouse. In the approach condition, a piece of cheese (gain) was lying outside the maze; in the avoidance condition an owl (threat) was depicted as hovering above the maze. In the goal fulfillment condition, participants finished the maze-task and as such successfully attained the piece of cheese (i.e., successful approach) or successfully escaped the owl (i.e., successful avoidance). In the unfulfilled goal condition, the maze task was unexpectedly "frozen" at two-thirds of the maze. Participants received a seemingly inserted "operator message" that due to technical problems they would now continue with the next task and return to the maze later on in the experiment. Then followed 30 problems from the RAT that were presented in random order (see Study 4.1). Following the RAT, participants answered a short questionnaire and were debriefed.

*Dependent variables.* We coded the number of correctly solved RAT problems (range between 0 and 30). Cheerfulness and relief were measured as before. Finally, we measured *level of activation*. Participants indicated how activated [engaged, attentive] (α = .75) they felt on a Likert scale ranging from 1 (not at all) to 5 (very much).

Table 4.3

*Means (Standard Deviations) for RAT Performance and Mood Ratings as a Function of Motivational orientation and Regulatory Success*

| | Regulatory Success | | | |
|---|---|---|---|---|
| | Goal fulfilled | | Goal unfulfilled | |
| | Approach | Avoidance | Approach | Avoidance |
| | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) |
| RAT performance | 12.75 (3.77) | 9.50 (4.30) | 10.62 (3.77) | 12.33 (3.82) |
| Activation | 3.49 (.86) | 2.24 (1.23) | 2.79 (.83) | 2.92 (1.03) |
| Relief | 3.92 (.60) | 4.26 (.39) | 4.02 (.54) | 3.94 (.62) |
| Cheerfulness | 3.50 (.63) | 3.36 (.49) | 3.49 (.67) | 3.11 (.77) |

## Results

*Creative performance*. We submitted the number of solved RAT problems to a 2 (motivational orientation) x 2 (regulatory success) ANOVA. Cell means are given in Table 4.3. We obtained our predicted (Hypothesis 1) interaction effect among motivational orientation and regulatory success on RAT performance, $F(1, 73) = 7.72$, $p < .01$; partial $\eta^2 = .10$. Contrast analyses revealed that in the regulatory success condition, avoidance oriented participants solved fewer problems ($M = 9.50$) than approach oriented participants ($M = 12.75$), $F(1, 73) = 6.49$, $p = .01$; partial $\eta^2 = .08$. In the unfulfilled goal condition, no effect of motivational orientation was observed, $F < 1.9$, ns. No other effects were found, $F < 1$.[17]

*Activation and post-task mood.* We submitted ratings of activation, relief, and cheerfulness to separate 2 (motivational orientation) x 2 (regulatory success) ANOVA's. Cell means are given in Table 4.3. For activation, we found a main effect of motivational orientation, $F(1, 73) = 6.11$, $p < .05$; partial $\eta^2 = .08$, showing that

[17] Although RAT-problems vary in difficulty, adding difficulty level to the analyses as a within-subjects variable did not change our results.

participants in the approach condition felt more engaged and activated ($M$ = 3.13) than participants in the avoidance condition ($M$ = 2.58). This effect was qualified by an interaction among regulatory success and motivational orientation, $F(1, 73) = 9.29$, $p < .01$; partial $\eta^2 = .11$. Table 4.3 shows that participants reported more activation in the successful approach condition than in the successful avoidance condition, $F(1, 73) = 15.10$, $p < .01$; partial $\eta^2 = .17$; however, no difference in activation was found between participants in the unsuccessful approach condition and participants in the unsuccessful avoidance condition, $F < 1$. With regards to ratings of cheerfulness and relief, no significant effects were found, all $F$s < 3.1, ns.

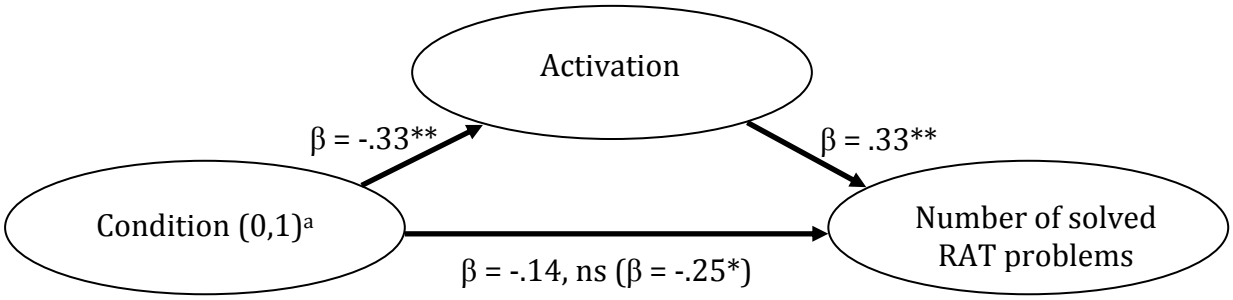


*Figure 4.2*. Mediation of the Interaction among Motivational Orientation and Regulatory Success on Insight Performance by Activation

*Note.* [a]Successful avoidance = 1; Other conditions = 0.

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

*Mediation tests*. To test for mediation, we computed a series of regression analyses along the criteria set forth by Kenny et al. (1998), in which we compared the successful avoidance condition (set as 1) versus the other conditions (set as 0). As can be seen in Figure 4.2, activation regressed significantly on condition ($\beta = -.33$, $t = -3.02$, $p < .01$). When we regressed RAT performance on condition after controlling for activation, the originally significant effect of condition ($\beta = -.25$, $t = -2.22$, $p < .05$) dropped to non-significance ($\beta = -.14$, $t < 1.3$, ns); the effect of activation was significant ($\beta = .33$, $t = 2.87$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -2.09$, $p < .05$.[18] This supports Hypothesis 5.

[18] Because we did not find significant effects of motivational orientation and regulatory success on self-reported relief and cheerfulness, formal mediation by these feelings cannot be established. However, for the sake of completeness, we computed correlations among ratings of relief and cheerfulness and the number of solved RAT-problems. Correlations failed to reach significance, all $p$s > .25.

## Discussion and Introduction to Study 4.4

Replicating findings from Study 4.1 and 4.2, we found that the effect of motivational orientation on creative performance was qualified by regulatory success. Supporting Hypothesis 1, we found that avoidance oriented individuals in the fulfilled goal condition (i.e., successful avoidance) solved fewer RAT problems than the individuals in other conditions. Moreover, we found that successful avoidance lowered creativity because it led to lower levels of activation (Hypothesis 5).

Our objective with Study 4.4 was twofold. First, we wanted to replicate our findings with another type of creativity task. We therefore used a divergent thinking (brainstorming) task, and (as in Study 4.2) assessed fluency (number of ideas), originality, cognitive flexibility (number of categories) and cognitive persistence (within-category fluency). We expected that fluency and originality would be lower in the successful avoidance condition than in the other conditions (Hypothesis 1) and that this effect would be mediated by activation (Hypothesis 5). Second, we wanted to examine whether the effects of our manipulations were due to cognitive persistence or to cognitive flexibility, and using a brainstorming task allowed us to do so. Previous work suggests that an approach orientation induces a broad attentional scope and facilitates cognitive flexibility (Friedman & Förster, 2000, 2001; see also De Dreu et al., 2009). We therefore expected that approach orientation leads to greater cognitive flexibility than avoidance orientation, independent of regulatory success (goal attainment or not). This is Hypothesis 6. Furthermore, previous work suggests that moods that associate with unsuccessful avoidance (e.g., fear, anxiety) seem not to lead to higher levels of flexibility, but rather to higher levels of persistence (as in our Study 4.2, also Baas et al., 2008; De Dreu et al., 2008; Verhaeghen et al., 2005). Accordingly, we predicted that unsuccessful avoidance leads to greater cognitive persistence as compared to the successful avoidance and approach conditions (cf. Hypothesis 4).

### Method

*Design and participants*. Undergraduate students ($N$ = 66, 68% female) with a mean age of 22.9 years ($SD$ = 6.8) participated for 5 Euros (approx. US $ 6.5) and were randomly assigned to the conditions of a 2 (motivational orientation: approach vs. avoidance) x 2 (goal attainment vs. not) between-subjects factorial. Dependent variables were four measures of creativity (originality, creative fluency, cognitive

flexibility, and cognitive persistence) and self-reported activation, relief, and cheerfulness.

*Procedure, manipulations, and creativity task*. These were the same as in Study 4.3, except that we replaced the RAT with the unusual uses task (De Vet & De Dreu, 2007; Friedman & Förster, 2001; Guilford, 1967). Participants were given 4 minutes to write down as many different creative ways to use a tin can as possible. They were told that the ideas had to be neither typical nor virtually impossible. Following the unusual uses task, participants answered a short questionnaire, were debriefed, paid for participation, and dismissed.

*Dependent variables.* Four raters separately counted the number of non-redundant ideas generated per participant. This was our measure of creative *fluency*. Cognitive *flexibility* was extracted from the data by first having the four raters separately attach categories to the different ideas. Reliability among coders was excellent (Cohen's κ = .82). Next, the number of non-redundant categories was counted for each participant as a measure of cognitive flexibility. *Persistence* was operationalized as within-category fluency–the number of unique ideas divided by the number of categories from which these ideas were sampled. Originality of ideas was based on the relative infrequency of ideas. Ideas were considered original, and received a score of 1, if they were coded in categories that were used by 1 percent or less of the participants. This resulted in a total of 149 original ideas (22.3 %). We counted the number of original ideas per participant as a measure of *originality.* Feelings of activation, cheerfulness and relief were measured as before.

**Results**

*Descriptive statistics.* Table 4.4 shows the means and standard deviations, along with the zero-order correlations for all study variables. It shows, first, strong positive correlations among the creativity measures fluency, originality, flexibility, and persistence. Second, fluency, originality, and flexibility correlated positively with ratings of activation. Third, ratings of relief and cheerfulness did not correlate significantly with any of the creativity measures.

*Creative performance*. We submitted four creativity measures (originality, fluency, persistence, and cognitive flexibility) to separate 2 (motivational orientation) x 2 (regulatory success) ANOVA's. Cell means are given in Table 4.5. For

originality, we found a main effect of motivational orientation $F(1, 62) = 4.49$, $p < .05$; partial $\eta^2 = .07$. Participants in the approach condition ($M = 2.73$) were more original than participants in the avoidance condition ($M = 1.79$). Furthermore, we found our predicted interaction between motivational orientation and regulatory success, $F(1, 62) = 4.53$, $p < .05$; partial $\eta^2 = .07$. Contrast analyses revealed that in the regulatory success condition, avoidance oriented participants were less original ($M = 1.06$) than approach oriented participants ($M = 2.94$), $F(1, 62) = 9.06$, $p < .01$; partial $\eta^2 = .13$. In the regulatory failure condition, no effect of motivational orientation was observed, $F < 1$.

Table 4.4

*Descriptive Statistics and Zero-Order Correlations*

| | *M.* | *SD.* | 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|---|---|---|
| 1. Fluency | 9.65 | 4.26 | | | | | | |
| 2. Originality | 2.26 | 1.89 | .74** | | | | | |
| 3. Flexibility | 6.88 | 2.65 | .85** | .78** | | | | |
| 4. Persistence | 1.41 | 0.36 | .44** | .03 | -.06 | | | |
| 5. Activation | 2.85 | 0.58 | .43** | .41** | .44** | .03 | | |
| 6. Relief | 4.40 | 0.54 | -.08 | -.16 | -.07 | .02 | -.56** | |
| 7. Cheerfulness | 3.58 | 0.54 | .07 | .01 | .07 | .03 | -.10 | .35** |

*Note.* * $p < .05$. ** $p < .01$. ($N = 66$).

For the number of ideas, we found a main effect of motivational orientation, $F(1, 62) = 5.59$, $p < .05$; partial $\eta^2 = .08$. Participants in the approach condition ($M = 10.85$) generated more ideas than participants in the avoidance condition ($M = 8.45$). The interaction between motivational orientation and regulatory success was marginally significant, $F(1, 62) = 3.31$, $p < .075$; partial $\eta^2 = .05$. Contrast analyses revealed that in the regulatory success condition, avoidance oriented participants generated fewer ideas ($M = 7.25$) than approach oriented participants ($M = 11.44$), $F(1, 62) = 8.92$, $p < .01$; partial $\eta^2 = .13$. In the regulatory failure condition, no effect of motivational orientation was observed, $F < 1$. Together, these results are once again consistent with Hypothesis 1.

For cognitive flexibility, we found a main effect of motivational orientation

$F(1, 62) = 4.26$, $p < .05$; partial $\eta^2 = .06$. Consistent with Hypothesis 6, participants in the approach condition ($M$ = 7.52) generated ideas in more categories than participants in the avoidance condition ($M$ = 6.24). The interaction between motivational orientation and regulatory success was marginally significant, $F(1, 62) = 2.91$, $p < .10$; partial $\eta^2 = .05$. Contrast analyses revealed that in the regulatory success condition, participants in the avoidance condition produced less diverse categories ($M$ = 5.25) than participants in the approach condition ($M$ = 7.61), $F(1, 62) = 7.04$, $p < .05$; partial $\eta^2 = .10$. In the regulatory failure condition, however, no effect of motivational orientation was observed, $F < 1$. Finally, and inconsistent with Hypothesis 4, no significant effects were found for within-category fluency, $F$s < 1.8, ns. Thus, as compared to the successful avoidance condition, both the approach conditions (independent of regulatory success) and the unsuccessful avoidance condition led to higher levels of cognitive flexibility rather than cognitive persistence. We return to this in the General Discussion below.

Table 4.5

*Means (Standard Deviations) for Creative Ideation and Mood Ratings as a Function of Motivational orientation and Regulatory Success*

| | Regulatory Success | | | |
|---|---|---|---|---|
| | Goal fulfilled | | Goal unfulfilled | |
| | Approach | Avoidance | Approach | Avoidance |
| | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) | *M* (*SD*) |
| Originality | 2.94 (2.31) | 1.06 (1.06) | 2.47 (1.51) | 2.47 (1.94) |
| Number of ideas | 11.44 (4.72) | 7.25 (3.62) | 10.13 (4.05) | 9.59 (3.69) |
| Flexibility | 7.61 (2.77) | 5.25 (2.72) | 7.40 (2.26) | 7.18 (2.32) |
| Persistence | 1.51 (.36) | 1.43 (.42) | 1.38 (.40) | 1.32 (.27) |
| Activation | 2.99 (.69) | 2.54 (.61) | 2.91 (.49) | 2.95 (.40) |
| Relief | 4.30 (.70) | 4.42 (.52) | 4.58 (.34) | 4.35 (.49) |
| Cheerfulness | 3.61 (.57) | 3.60 (.44) | 3.76 (.50) | 3.35 (.58) |

*Activation and post-task mood.* We submitted ratings of activation, cheerfulness, and relief to separate 2 (motivational orientation) x 2 (regulatory success) ANOVA's. Cell means are given in Table 4.5. With regards to ratings of cheerfulness and relief, no significant effects were found, all $F$s < 2.5, ns. For self-reported activation we found a marginally significant interaction among motivational

orientation and regulatory success, $F(1, 62) = 3.20$, $p < .08$; partial $\eta^2 = .05$. Contrast analyses revealed that in the regulatory success condition, participants with an avoidance orientation reported less activation ($M = 2.54$) than those with an approach orientation ($M = 2.99$), $F(1, 62) = 5.20$, $p < .05$; partial $\eta^2 = .08$. In the regulatory failure condition, no effect of motivational orientation was observed, $F < 1$.

*Mediation tests for originality.* To test for mediation for originality, we computed a series of regression analyses in which we compared the successful avoidance condition (set as 1) versus the other conditions (set as 0). Activation regressed significantly on condition ($\beta = -.31$, $t = -2.60$, $p = .01$). When we regressed originality on condition after controlling for activation, the originally significant effect of condition ($\beta = -.36$, $t = -3.09$, $p < .01$) dropped but remained significant ($\beta = -.26$, $t = -2.21$, $p < .05$); the effect of activation was significant ($\beta = .34$, $t = 2.88$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -1.95$, $p = .05$. In other words, and consistent with Hypothesis 5, participants in the successful avoidance condition were less original than participants in the unsuccessful avoidance and approach conditions combined, because of lowered levels of activation.

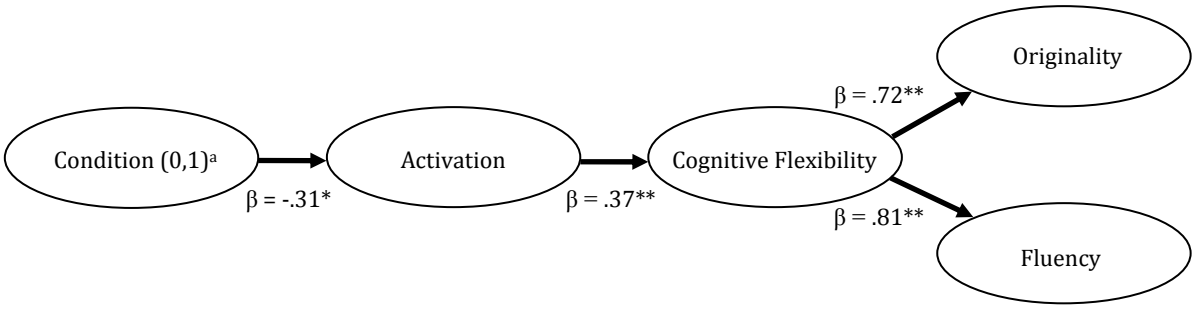


*Figure 4.3*. Mediation of the Interaction among Motivational Orientation and Regulatory Success on Originality and Fluency by Activation and Flexibility

*Note.* [a]Successful avoidance = 1; Other conditions = 0.

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

In a second series of regression analyses, we tested whether activation has its effect on originality through flexibility. First, when we regressed cognitive flexibility on condition after controlling for activation, the originally significant effect of condition ($\beta = -.35$, $t = -2.99$, $p < .01$) dropped but remained significant ($\beta = -.24$, $t = -$

2.06, $p < .05$); the effect of activation was significant ($\beta = .37$, $t = 3.17$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -2.03$, $p < .05$. Second when we regressed originality on condition after controlling for cognitive flexibility, the originally significant effect of condition ($\beta = -.36$, $t = -3.09$, $p < .01$) dropped to non-significance ($\beta = -.10$, $t < 1.2$, ns); the effect of cognitive flexibility was highly significant ($\beta = .75$, $t = 9.02$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -2.83$, $p < .01$. Finally, and as can be seen in Figure 4.3, when we entered condition (1), activation (2), and cognitive flexibility (3) in the regression model, only the effect of flexibility was significant, $\beta = .72$, $t = 8.06$, $p < .01$. Thus, the deactivating nature of successful avoidance (vs. the unsuccessful avoidance and approach conditions combined) has its effect on originality through decreased flexibility.

*Mediation tests for fluency.* We conducted the same analyses to test for mediation for fluency. When we regressed creative fluency on condition after controlling for activation, the originally significant effect of condition ($\beta = -.32$, $t = -2.72$, $p < .01$) dropped to non-significance ($\beta = -.21$, $t < 1.8$, ns); the effect of activation was significant ($\beta = .37$, $t = 3.15$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -2.01$, $p < .05$. In other words and consistent with Hypothesis 5, participants in the successful avoidance condition were less fluent than participants in the unsuccessful avoidance and approach conditions combined, because of lowered levels of activation. In a second step, when we regressed fluency on condition after controlling for cognitive flexibility, the originally significant effect of condition ($\beta = -.32$, $t = -2.72$, $p < .01$) dropped to non-significance ($\beta = -.03$, $t < 1$); the effect of cognitive flexibility was significant ($\beta = .84$, $t = 11.72$, $p < .01$). A Sobel-test confirmed that the mediation was significant, $Z = -2.88$, $p < .01$. Finally, and as can be seen in Figure 4.3, when we entered condition (1), activation (2), and cognitive flexibility (3) in the regression model, only the effect of flexibility was significant, $\beta = .81$, $t = 10.53$, $p < .01$. Thus, the deactivating nature of successful avoidance (vs. the unsuccessful avoidance and approach conditions combined) has its effect on fluency through decreased flexibility.[19]

[19] Because we did not find significant effects of motivational orientation and regulatory success on self-reported relief and cheerfulness, formal mediation by these feelings cannot be established. However, for the sake of completeness, we computed correlations among ratings of relief and cheerfulness and the four creativity measures. Results showed no significant correlations, $p > .20$.

## General Discussion

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 greater creativity than avoidance related states (Baas et al., 2008; Friedman & Förster, 2000, 2002). However, our results suggest that avoidance states can produce similar levels of creativity as approach states. When avoidance states are activating (fear, unfulfilled avoidance motivation), they lead to many and original ideas, insights, and problem solutions; only when avoidance states deactivate and lead to disengagement (relief, successful avoidance), creativity breaks down. Thus, across all four studies our results 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. This general finding contributes to earlier work on the role of approach versus avoidance orientation and creativity (e.g., Friedman & Förster, 2000, 2002, 2005b), to the Dual Pathway to Creativity Model (De Dreu et al., 2008), and has some implications for our thinking about the relationship between mood and creativity (Baas et al., 2008). Below we discuss these implications in more detail and discuss possibilities for new research.

### Theoretical and Practical Implications

The Dual Pathway to Creativity Model (DPCM; De Dreu et al., 2008) proposes two routes towards creativity – flexibility and persistence – and for both flexibility and cognitive persistence, the individual needs to somehow be cognitively activated and aroused. This is a critical deviation from the widely shared notion that creativity results from being relaxed, unfocused, and unengaged (e.g., Bransford & Stein, 1984; Martindale, 1999). Rather, and consistent with the classic notion that performance is related to stress in a curvilinear way (Broadbent, 1972; Staw et al., 1981; Yerkes & Dodson, 1908), DPCM proposes that at moderate levels of activation and arousal, both cognitive flexibility and persistence can be facilitated more than under excessively low, or excessively high levels of activation and arousal.

In line with DPCM, our results suggest that any motivational state that activates and engages the individual, regardless of its association with approach or avoidance, will enhance creativity. Whether approach or avoidance states activate or not depends on regulatory success, the sense of success or progress towards fulfilling a goal. Because approach states are generally activating (e.g., Carver, 2004; Pickering & Gray, 1999), creativity is enhanced regardless of doing well versus poor.

However, for avoidance motivation regulatory success does matter. When avoiding a negative outcome, being blocked, a lack of progress, and failure result in enhanced activation, effort and persistence, but when avoidance goals and concomitant avoidance motivation is successfully regulated, the individual is deactivated and in a state of disengagement (Carver, 2004; Förster et al., 2001; Frijda, 1986; Idson & Higgins, 2000; Mowrer, 1960). In other words, avoidance states that are associated with unfulfilled goals (fear, unsuccessful avoidance) are activating and engaging, whereas avoidance states that are associated with fulfilled goals (relief, successful avoidance) are deactivating. And indeed, activation mediated the effects of motivational orientation and regulatory success on creative insight performance and creative ideation (Study 4.3 and 4.4).

The finding that activation and engagement (but not feeling cheerful or relieved) mediated the effects of motivational orientation and regulatory success on creative insight performance and creative ideation has several implications. First, and in contrast to other beliefs about the ways motivational states impact creativity (Fiedler, 1988; Lyubomirsky et al., 2005; Murray et al., 1990), self-reported "hot" feelings such as relief and cheerfulness are less important in predicting creativity than motivational orientation, regulatory success, and activation. In fact, in none of our four studies we found that self-reported feelings mediated the effects of our manipulations on creativity. Instead, activation mediated effects of motivational orientation and regulatory success on conceptual insight performance (Study 4.3) and the number and originality of ideas (Study 4.4). In Study 4.2, we found that fear, an activating avoidance-related mood state, produced greater creative fluency than relief, a deactivating avoidance-related mood state. This effect was mediated by successful avoidance of a negative outcome but not by lowered self-reported ratings of relief.

Together, these results support and extend the conclusion that "effects of motivational states on attention, memory, and problem solving (including creativity) may rely heavily on the extent to which the anticipatory versus arousal components are rendered predominant. Ironically, it follows from this reasoning that many of the effects of emotion on cognition may result from the "cold" cognitive aspect of emotion states (e.g., their regulatory focus [or motivational orientation]; Higgins, 2000; or their underlying appraisal themes; Lerner & Keltner, 2000) rather than their "hot" arousing aspect (the aspect that is intuitively most representative of emotional phenomena)" (Friedman & Förster, 2005b, p. 272). Current findings indeed show that "hot" somatic components have no effects on creativity and that

differences in motivational orientation might be more important for creativity. However, they add to those by Friedman and Förster (2000, 2005b) in that they suggest (1) that earlier findings need to be understood in terms of the interaction between motivational orientation and regulatory success, and (2) that feelings of activation mediate the effects on creativity.

Our findings shed new light on at least three distinct lines of research. First, using the mouse-in-maze task, Friedman and Förster (2001, 2002) found that participants who found a way out of the maze while an owl was depicted as hovering above it (avoidance condition) solved fewer creative insight problems and generated fewer original ideas than participants who found a way out of the maze while a piece of cheese (gain) was lying outside the maze (approach condition). However, all participants finished the maze and therefore successfully approached a positive outcome and successfully avoided a negative outcome. This might be the reason for the obtained results – according to our reasoning, successful avoidance states lead to worse creative performance than approach states, because it deactivates and leads to disengagement. However, similar levels of creativity as in the approach condition are to be expected in a condition where participants do not successfully avoid the threat (i.e., if the mouse-in-maze task is stopped before participants can finish it). This is indeed what we found in Study 4.3 and 4.4 – avoidance states that activate and engage the individual (unfulfilled avoidance motivation) lead to similar levels of creativity as approach states. Only avoidance states that deactivate and lead to disengagement (successful avoidance) lead to lower levels of creativity.

Second, Akinola and Mendes (2008) asked participants to deliver a speech to two evaluators that either gave explicit positive feedback and exhibited positive nonverbal behavior, or gave explicit negative feedback and exhibited rejecting nonverbal behavior. Participants who received positive feedback showed lower levels of creativity on a subsequent artistic task than those who received negative feedback. Inasmuch as delivering a stressful public speech is a negative event that participants would like to avoid (Geer, 1965; Kirschbaum, Pirke, & Hellhammer, 1993), negative feedback signals unsuccessful avoidance and induces fear and anxiety while positive feedback signals successful avoidance and induces relief. In current terms, anxiety (or unfulfilled avoidance) is activating, and therefore produced higher levels of creativity than relief or successful avoidance.

Third, previous work shows that individual differences in anxiety and avoidance tendencies do not relate or relate negatively to creativity (Baas et al.,

2008; De Dreu et al., 2009; Mikulincer et al., 1990a). However, measures of trait anxiety, such as the Trait Anxiety Inventory (STAI, Spielberger et al., 1970), or measures of avoidance tendencies such as the Behavioral Inhibition Scale (Carver & White, 1994) reflect a propensity for threatening objects and situations. This proneness to anxiety and avoidance tendencies associates with vigilance and increased arousal (Gray, 1990) but only when threats are present or mentally activated (Heller, Nitschke, Etienne, & Miller, 1997). In the absence of threat, the behavioral avoidance system is at rest and little activity and activation is expected. We suspect this is the reason why individual differences in anxiety and avoidance tendencies not relate or relate negatively to creativity. Only when fear is aroused by imagery or in the presence of stressful threatening conditions, creativity is enhanced (Study 4.2, see also Akinola & Mendes, 2008; De Dreu et al., 2008).

**Limitations and Avenues for Future Research**

DPCM proposes two routes towards creativity – flexibility and persistence – and it has been suggested that activating approach states stimulate creativity primarily through the flexibility route whereas activating avoidance states may stimulate creativity primarily through the persistence route (Baas et al., 2008; Friedman & Förster, 2008). Findings from Study 4.4 indeed show that approach states stimulate creative fluency, originality and flexibility more than avoidance states. However, that activating avoidance states would stimulate creativity through persistence received inconsistent support. In Study 4.2 we found that fear produced greater cognitive persistence than relief (see also De Dreu et al., 2008), but in Study 4.4, we found that unfulfilled avoidance did not result in greater cognitive persistence than successful avoidance. Instead, it resulted in greater cognitive flexibility.

We suspect 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 crows 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) and that flexibility mediated effects of moderately arousing states (unsuccessful avoidance in the mouse-in-maze task; Study 4.4). New research testing the effects of low-to-moderate-to high arousing avoidance states is needed to conclude this issue. Such new research could also endeavor to further understand similar processes in the case of approach orientation. 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 (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, we would expect neither avoidance-oriented nor approach-oriented individuals to be very creative – the former because of rigidity of thought and the latter because of high distractibility.

## Conclusion

Our work revealed that avoidance states can result in similar levels of creativity as approach states and that activation is the key mediating variable. When avoidance states are activating and stimulating the individual, high levels of creativity are to be expected; only in cases where avoidance motivation is successfully regulated, the individual gets deactivated and as a consequence is less creative. As such, it is likely that anxious artists, engineers under stressful pressure, and managers facing a major crisis will be more creative than when they feel relieved, have escaped failure, or have successfully confronted the crisis.