Motivated creativity: A conservation of energy approach
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Chapter Three

Necessity is the Mother of Invention: Avoidance Motivation Stimulates Creativity through Cognitive Effort

Motivated Creativity

Creativity differentiates excellent artists and scientists from their mediocre colleagues (Csikszentmihalyi, 1996), is needed to solve complex problems (Newell & Simon, 1972), helps people to manage social conflicts and disputes (De Dreu & Nijstad, 2008), gain power (Sligte, De Dreu, & Nijstad, 2011), attract mates (Griskevicius, Cialdini, & Kenrick, 2006; Haselton & Miller, 2006), and is used to communicate an ugly truth without hurting another's feelings (Walczyk, Runco, Tripp, & Smith, 2008). Not surprisingly, identifying how and why people generate creative ideas or solutions receives a lot of attention in research. One key factor that has repeatedly proved to predict creativity, is whether people focus on achieving positive outcomes (approach motivation) rather than avoiding negative outcomes (avoidance motivation) (Cretenet & Dru, 2009; Elliot et al., 2009; Friedman & Förster, 2002; Mehta & Zhu, 2009). The enhanced creativity under approach motivation is explained by the explorative, flexible, and broad focus associated with focusing on attaining positive outcomes (Friedman & Förster, 2002, 2005a, 2005b).

The robust finding that approach motivation evokes more creativity that avoidance motivation, seems at odds with the Dual Pathway to Creativity Model (De Dreu et al., 2008; Baas et al., 2008; Nijstad et al., 2010). The Dual Pathway to Creativity model suggests that creative output can be achieved through two distinct cognitive pathways: cognitive flexibility and cognitive persistence. We propose that approach motivated individuals engage in a relatively flexible processing style, and switch flexibly between different categories and approaches. Avoidance motivated people, in contrast, engage in a relatively persistent processing style, and systematically and persistently explore a few categories and approaches in-depth. According to the Dual Pathway to Creativity Model, both processing styles can result in equally creative output, which raises the question why previous work has repeatedly shown that approach motivation leads to more creativity than avoidance motivation. To solve this apparent inconsistency we propose that avoidance motivated individuals need to exert more effort to reach high levels of creativity, because with their processing style creative performance is relatively difficult and demanding. From a conservation of energy perspective (e.g., Tooby & Cosmides, 1990) this implies that additional motivators are needed to achieve high levels of creativity. When these motivators are absent, the cognitive costs of performing creatively exceed the potential benefits, explaining why avoidance motivated people are less creative.

In five experiments, we test the core predictions resulting from this line of reasoning. First, we show that approach motivation associates with flexible processing
and avoidance motivation with systematic and persistent processing (Experiment 3.1). Second, we show that avoidance motivated people can be as creative as approach motivated people, but they are only creative when creative performance is functional to goal-achievement (all experiments). Third, we demonstrate that performing creatively is costly for avoidance motivated individuals: They have more difficulty with creative tasks and feel more depleted after performing creatively than approach motivated individuals (Experiments 3.2a, 3.2b, and 3.3). Finally, we report evidence that one reason why creative performance may be depleting for avoidance motivated individuals is that they rely more on top-down cognitive control and working memory (Experiment 3.4).

**Avoidance Versus Approach Motivation and Creativity**

Creativity may be defined as the generation of ideas, insights, or solutions that are both novel and appropriate or useful (Amabile, 1983; Guilford, 1967; Hennessey & Amabile, 2010). As indicated in our opening examples, creativity can be functional to goal attainment (e.g., to solve problems or win conflicts). Goals are concrete cognitive representations of desired or undesired end states that are used to guide behavior (Austin & Vancouver, 1996), and direct behavior toward positive and away from negative outcomes (Elliot, 2006, 2008). Interestingly, past work on motivational orientation and creativity suggests that it makes a difference whether people seek positive outcomes and adopt an approach motivation or try to avoid negative outcomes and adopt an avoidance motivation. Specifically, approach (as compared with avoidance) tendencies have been linked to increased creativity. Behavioral approach (arm flexion) led to more creative insight (Cretenet & Dru, 2009; Friedman & Förster, 2002) and more creative idea generation (Friedman & Förster, 2002) than behavioral avoidance (arm extension). The prospect of positive outcomes leads to more creative ideas about unusual uses for a brick than the prospect of negative outcomes (Friedman & Förster, 2005a), and people designed more creative children's toys when seeing the color blue (presumably triggering approach motivation) than when seeing the color red (triggering avoidance motivation; Elliot et al., 2009; Mehta & Zhu, 2009).

The difference in creativity between approach and avoidance motivated individuals can be explained by the different cognitive processing styles they adopt. Focusing on positive outcomes makes people more risk-tolerant and leads to explorative behavior (Friedman & Förster, 2002, 2005a, 2005b); attentional flexibility (Friedman & Förster, 2005b); and a high speed, low effort, and efficient processing style (Winkielman et al., 2003). It is further related to an abstract (Semin et al., 2005) and global (Förster & Higgins, 2005a) way of thinking. A vast body of literature shows that
this flexible, fluent, and divergent way of thinking can stimulate creativity (e.g., Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Ward, Patterson, & Sifonis, 2004; Winkielman et al., 2003). Avoidance motivation, however, has been related to a more risk-averse, persevering processing style (Friedman & Elliot, 2008; Friedman & Förster, 2002). Avoidance motivation promotes a vigilant way of reasoning (Elliot, 2006; Friedman & Förster, 2005b), a focused attention scope (Mehta & Zhu, 2009), recruitment of cognitive control (Koch et al., 2008, 2009), and persistence on solving problems (Friedman & Elliot, 2008).

The risk averse, structured, and persistent processing style evoked by avoidance motivation has been related to diminished creativity. Indeed, some authors argue that this processing style is incompatible with creativity, and contrast this more analytical thinking with creative thinking (e.g., Ansburg & Hill, 2003; Förster et al., 2009). Recent work however, revealed that people who focus on preventing negative outcomes can be as creative as people who focus on achieving positive outcomes as long as their goals are unfulfilled. Baas, De Dreu, and Nijstad (2011a) asked participants to complete a maze in which a cartoon mouse was depicted as either trying to find a piece of cheese at the end of the maze or trying to escape from an owl that was hovering over the maze. Participants either successfully completed the maze by leading the mouse out of the maze (and thus successfully obtaining the piece of cheese or escaping the owl), or were interrupted during the maze task by a ‘technical error’. Participants focusing on escaping the owl (prevention-focus) performed better on creative insight tasks and generated more original ideas when they had not completed the maze task, and thus had not yet completed their prevention-goal, than when they had completed the maze task. Moreover, their level of creativity did not differ from participants focusing on obtaining the piece of cheese (promotion-focus).

The Baas et al. (2011a) study thus suggests that avoidance motivated individuals can be as creative as approach motivated individuals. However, these findings may be interpreted in two different ways: One possibility is that active or unfulfilled prevention goals and the associated higher levels of task engagement change the persistent and systematic processing style into a more flexible and divergent processing style. Alternatively, it is possible that avoidance motivated individuals maintain their ‘default’ persistent processing style and compensate for this inefficient (for creativity) processing style by investing more cognitive resources. Although the Baas et al. study did not provide evidence for or against either of these possibilities, the Dual Pathway to Creativity Model suggests the second option to be most viable. In particular, the interpretation of their findings would be that having an unfulfilled prevention goal...
triggers a mindset in which people are highly focused and engaged (because of the prospect of imminent loss), and this mindset is transferred to the subsequent creativity task. In turn, this focused and engaged mindset leads to high levels of creativity in the subsequent task through persistent processing. Below we introduce the Dual Pathway to Creativity Model, and subsequently integrate it with a novel Conservation of Energy Account to explain when and how avoidance motivation can lead to creative performance.

**The Dual Pathway to Creativity Model**

The Dual Pathway to Creativity Model (De Dreu et al., 2008; also Baas et al., 2008; Nijstad et al., 2010) was initially developed to integrate and combine various insights on the effects of moods on psychological processes driving creative performance. The model’s main assumption is that creative outputs such as original ideas, problem solutions, and insights can be achieved through two distinct pathways: the flexibility pathway and the persistence pathway.

The flexibility pathway captures the vast body of research showing that creativity can be achieved through a flexible, fluent, and divergent way of thinking (e.g., Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Winkielman et al., 2003). This flexible cognitive style is associated with low effort, low resource demands, high speed, and efficient processing (De Dreu et al., 2008; Dietrich, 2004; Evans, 2003; Oppenheimer, 2008; Winkielman et al., 2003). It manifests itself in flat associate hierarchies, the use of multiple and broad cognitive categories, and a global processing style (i.e., a focus on the forest rather than the trees; Förster et al., 2009). The persistence pathway captures research showing that creativity can also be achieved through a persistent and systematic way of thinking (Dietrich, 2004; Dietrich & Kanso, 2010; Finke, 1996; Sagiv et al., 2010; Simonton, 1997). In contrast to cognitive flexibility, the persistent cognitive style is associated with high effort, perseverance and a slower speed of operation (De Dreu et al., 2008; Evans, 2003; Winkielman et al., 2003). As it relies more on executive control, it is more constrained by working memory capacity (De Dreu et al., 2012; Evans, 2003; Süss et al., 2002), and manifests itself in more in-depth exploitation of a relatively small number of cognitive categories (e.g., De Dreu et al., 2008; 2012).

Research supports a number of core tenets of the Dual Pathway to Creativity Model. In a first series of studies, De Dreu and colleagues (2008) proposed that mood predicts creativity when, and because, it is activating. Happiness and anger, for example, activate more than relaxation and sadness. However, happiness evokes a flexible and
global processing style and should lead to creativity through the flexibility pathway. Anger, in contrast, stimulates persistent and focused processing, and should lead to creativity through the persistence pathway. Indeed the results supported this idea, showing that activating moods led to more original ideation and better creative insight performance than de-activating moods - through flexible processing when mood valence was positive, and through persistent processing when mood valence was negative (Baas et al., 2008; Hirt et al., 2008). In another series of studies, Rietzschel, De Dreu, and Nijstad (2007) showed that individuals with high personal need for structure, who have an aversion of ill-defined situations (like most creativity tasks), were quite creative when and because they engaged in persistent cognitive processing. Finally, working memory capacity and executive control positively relate to original ideation and creative insight performance because executive control allows for persistent, bottom-up processing (De Dreu et al., 2012). Thus, it appears that certain traits and states activate either a flexible or a persistent processing, and that through both flexibility and persistence high levels of creative output can be achieved.

The Dual Pathway to Creativity Model thus predicts that creative performance can be achieved not only through flexible processing, but also through persistent processing. We further know that approach motivation evokes a relatively flexible processing style, and that avoidance motivation evokes a relatively persistent processing style (Friedman & Elliot, 2008; Friedman & Förster, 2002, 2005a, 2005b; Koch et al., 2008; 2009). Nijstad et al. (2010) therefore advanced the basic prediction that approach motivation may lead to creativity through flexible processing, and that avoidance motivation may lead to creativity through persistent processing. Although the first prediction has received support in a recent series of studies (De Dreu et al., 2011), the second has not been tested directly. Furthermore, as indicated above, this prediction is seemingly at odds with existing evidence.

**Conservation of Energy: Persisting Only When it Matters**

A critical issue that has been addressed neither theoretically nor empirically, is that compared with flexible processing, engaging in persistent and controlled processing is rather costly – it requires executive control and working memory capacity, and taxes cognitive resources and energy (Bohner et al., 1995; Chaiken & Trope, 1999; Evans, 2003; Koch et al., 2008; 2009; Winkielman et al., 2003). From a conservation of energy perspective (e.g., Tooby & Cosmides, 1990), it follows that people are more reluctant – consciously or unconsciously – to engage in such effortful and persistent processing, which may explain why approach motivated individuals are generally more creative than avoidance motivated individuals.
Building on the finding of Baas et al. (2011a) that avoidance motivation can result in equally creative output as approach motivation, we aim to generalize this finding and develop a more general Conservation of Energy Account for the conditions under which avoidance motivated individuals perform as creatively as approach motivated individuals. Our theory accounts for the Baas et al. (2011a) findings, and generates several additional new predictions. Critical to the conservation of energy account is the assumption that avoidance motivated individuals need to compensate for their inflexible cognitive style by investing effort and cognitive resources. Out of conservation of resources motives, avoidance motivated individuals are reluctant to exert effort and cognitive resources and therefore they require additional motivators to engage in energy consuming creative behavior. Such additional motivation may stem from previously unfulfilled prevention goals and the associated focused and engaged mindset, as in Baas et al. (2011a), but may also stem from other motivators, such as functionality of the creativity task itself for goal progress. Indeed, when deemed necessary, people go out of their way and engage in behaviors they would normally stay away from. For example, people who focus on eliminating losses are usually risk averse but when taking risks is the only way to eliminate a loss they do take risks (Scholer et al., 2010).

Additionally, the Conservation of Energy Account suggests that in order to exert effort and invest cognitive resources, these resources need to be available. Consequently, when cognitive resources are limited (e.g., because of dual task demands or previous depletion), avoidance motivated individuals' creative performance should be inhibited (more than that of approach motivated people). Finally, the Conservation of Energy Account formulates a concrete process related prediction for this phenomenon, namely, that high levels of creativity among avoidance motivated individuals will deplete their cognitive resources.

This reasoning leads to a number of hypotheses: First, from the Dual Pathway to Creativity Model we derive the hypothesis that approach motivation evokes a relatively flexible processing style, while avoidance motivation evokes a relatively persistent processing style (Hypothesis 1). Second, our Conservation of Energy Account suggests that avoidance motivated people only invest high levels of effort and thus achieve high levels of creativity when there are additional incentives to perform well, for example when performing creatively is functional for goal achievement. Accordingly, approach motivated individuals should be relatively creative regardless of the functionality of their creativity. Avoidance motivated individuals however, should be more creative when creativity is functional rather than not functional (Hypothesis 2). Third, given
their more persistent (and for creativity less effective) processing style, avoidance motivated people should find creative tasks more difficult than approach motivated people (Hypothesis 3).

When no additional incentives are present (e.g., when creativity is nonfunctional), high perceived task difficulty should prevent avoidance motivated individuals from exerting the necessary resources to be creative. Moreover, it should be more effortful for avoidance motivated people to achieve high levels of creativity. Thus, when they achieve high levels of creativity (i.e., when creativity is functional and they exert effort to be creative), avoidance motivated individuals should feel relatively depleted. We therefore expect more depletion for avoidance motivated individuals for whom creativity is functional, than for approach motivated individuals or for avoidance motivated individuals for whom creativity is nonfunctional (Hypothesis 4). Finally, one reason why creative activity is depleting for avoidance motivated people is that they engage in top-down and effortful cognitive control, which requires cognitive resources such as working memory capacity. We thus expect that under conditions in which cognitive resources are occupied (e.g., by performing a second task), creativity of avoidance motivated individuals is more inhibited than creativity of approach motivated individuals (Hypothesis 5).

**Overview of the Studies**

We conducted five experiments in which we assessed the effects of approach versus avoidance motivation and creative functionality on creative performance\(^2\). We assessed the cognitive processes that underlie creative performance among approach and avoidance motivated individuals when creativity is functional versus nonfunctional (Experiment 3.1). To test whether creative performance requires more effort for avoidance rather than approach motivated individuals, we measured the experience of depletion after creative performance (Experiments 3.2a, 3.2b, and 3.3). Finally, to test whether creative performance for avoidance motivated individuals relies more on working memory capacity than for approach motivated individuals, we assessed creative performance when working under a low or a high cognitive load (Experiment 3.4).

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\(^2\) We conceptualize creativity not as a process (e.g., creative vs. non-creative thinking), but as outputs such as products or ideas that can be evaluated on creativity (see Goldenberg et al., 1999). We expect that creative output can be the result of both flexible and persistent processing, but that in order for persistent processing to result in creative products people have to exert effort and invest cognitive resources. Creative performance thus requires more resources for avoidance motivated individuals, but both approach and avoidance motivated individuals can generate output that is equally creative.
Originality and novelty are considered essential characteristics of creative ideas (see e.g., Amabile, 1983; Carson, Peterson, & Higgins, 2003; Guilford, 1967; Torrance, 1974). Not surprisingly, a big part of creativity research focuses on the generation of original ideas in brainstorm sessions (e.g., De Dreu & Nijstad, 2008), the originality of drawings (e.g., Eisenberger & Armeli, 1997), the originality of generated alternate uses for common objects (e.g., Van Kleef, Anastasopoulou, & Nijstad, 2010), and even the originality of lies (Walczyk et al., 2008). Accordingly, in Experiments 3.1, 3.2, and 3.3, we focus on the originality of generated ideas. In Experiment 3.4 we focus on another aspect of creative cognition: creative insight (see Dietrich & Kanso, 2010; Sternberg & Davidson, 1995).

**Experiment 3.1**

In the first experiment we manipulated motivational orientation (approach vs. avoidance) and creative functionality (low vs. high). We used an idea generation task that allowed for detecting differences in cognitive processing styles to test whether avoidance motivated individuals adopt a relatively persistent processing style and approach motivated individuals a relatively flexible processing style (Hypothesis 1). Furthermore, we tested the hypothesis that avoidance motivated individuals can be as creative as approach motivated individuals, but only when creativity is functional for goal progress (Hypothesis 2).

**Method**

Seventy-eight students (52 women, $M_{\text{age}} = 22.4, SD = 4.9$) were randomly assigned to one of the 2 (functionality: low vs. high) x 2 (motivational orientation: approach vs. avoidance) conditions. Participants were informed that they would do two tasks: a brainstorm task and another task about which they would receive more information later. They were told that the time they would have to work on the second task depended on their performance, or the performance of another participant, on the brainstorm task. After the brainstorm task a die roll would decide whose performance, own or other’s, would determine the amount of time provided for the subsequent task. In the high functionality condition, when a 1 was rolled the other’s performance counted, and when a 2, 3, 4, 5, or 6 was rolled the own performance counted. In the low-functionality-condition, when a 1 was rolled the own performance counted, and when a 2, 3, 4, 5, or 6 was rolled the other’s performance counted. Approach motivation was induced by instructing participants “By generating ideas you can gain time. The more ideas you generate, the more time you gain for the second task, making it easier to do that task well”. Avoidance motivation was induced by instructing participants that
“By generating few ideas you can lose time. The fewer ideas you generate, the more time you lose for the second task, making it harder to do the task well”. Participants then brainstormed for 8 minutes (by typing ideas into the computer) about protecting the environment. Finally, participants were told they would not do a second task, and were thanked and paid for their participation.

**Originality.** For each idea, an originality score was computed: \[ 1 - \left( \frac{\text{percentage participants who generated the same idea}}{100} \right) \]. For example, the idea “improve public transport” was generated by 52% of the participants and received the originality score .48, and the idea “eat seasonal vegetables” was generated by 2% of the participants and received the originality score .98. The scale thus ranged from 0 (low originality) to 1 (high originality). The average originality score was used as an indicator of creativity (see Amabile, 1983; Carson et al., 2003; De Dreu et al., 2011; Guilford, 1967; Torrance, 1974).

**Flexibility and persistence.** Two independent coders categorized a subset of 410 ideas (20%), using a category system (used in Diehl 1991; Nijstad, Stroebe, & Lodewijkx, 2003) in which 10 different goals were crossed with five different means to achieve these goals, resulting in 50 categories. Examples of goals are ‘reduce air pollution’ and ‘animal protection’. Examples of means are ‘providing information’ and ‘organization and action’. Inter-rater agreement was good (Cohen’s κ =.86) and differences were resolved by discussion. One coder continued to categorize the remaining ideas.

The number of categories in which participants generated ideas, was used as an indicator of cognitive flexibility (Baruah & Paulus, 2011; De Dreu et al., 2008; 2012; Nijstad et al, 2010; Sligte et al, 2011). To assess cognitive persistence, we calculated how often participants switched between categories using the Adjusted Ratio of Clustering (ARC, Roenker, Thompson, & Brown, 1971; see also Baas et al., 2011b; Peterson & Mulligan, 2010). The ARC measures how often an idea is followed by an idea from the same category correcting for the number of chance repetitions. The scale usually ranges from 0 (chance clustering) to 1 (maximal clustering); higher ARC scores thus indicate more within-category persistence and more systematic and structured thinking.

**Results**

**Flexibility and persistence.** A 2 (functionality: low vs. high) x 2 (motivational orientation: approach vs. avoidance) Analysis of Variance predicting flexibility,
revealed that participants in the approach condition generated ideas in more categories ($M = 8.51, SD = 2.00$) than participants in the avoidance condition ($M = 7.51, SD = 2.51$), $F(1,74) = 4.09, p = .047, \eta^2 = .05$. There was no main effect of functionality or interaction effect. This finding supports the idea that approach motivation evokes a relatively flexible processing style.

A 2 (functionality: low vs. high) x 2 (motivational orientation: approach vs. avoidance) Analysis of Variance predicting persistence, revealed only a main effect of motivational orientation, $F(1,74) = 4.70, p = .033, \eta^2 = .06$, and no main effect of functionality or interaction effect. Participants in the avoidance-condition were more persistent (i.e., switched less between categories), indicated by higher ARC scores ($M = .31, SD = .23$) than those in the approach-condition ($M = .20, SD = .22$). These findings support Hypothesis 1 that avoidance motivation evokes a more persistent processing style than approach motivation, and this is not influenced by functionality. The means and standard deviations of all dependent variables in Experiment 3.1 are displayed in Table 3.1.

**Originality.** A 2 (functionality: low vs. high) x 2 (motivational orientation: approach vs. avoidance) Analysis of Variance predicting originality, revealed a main effect of functionality, $F(1,74) = 5.00, p = .028, \eta^2 = .06$, but no main effect of motivational orientation. Participants in the high-functionality condition ($M = .81, SD = .04$) created more original ideas than participants in the low-functionality condition ($M = .80, SD = .04$). Importantly, the interaction-effect was also significant, $F(1,74) = 5.79, p = .019, \eta^2 = .07$. A simple effects analysis revealed that participants in the avoidance-condition were more original when functionality was high ($M = .82, SD = .03$) than when it was low ($M = .78, SD = .04$), $F(1,75) = 9.70, p = .003$. In contrast, among participants in the approach-condition, functionality did not influence originality, $F(1,75) = .04, p = .838$. These results provide support for Hypothesis 2 that functionality increases creativity more among avoidance rather than approach motivated individuals.

**Fluency.** We found no main effect of motivational orientation on fluency, and no interaction effect, $F$'s $< 1.5$. A trend for functionality, $F(1,74) = 3.44, p = .068, \eta^2 = .04$, suggested that participants in the high-functionality condition generated more ideas ($M = 28.35, SD = 11.64$) than those in the low-functionality condition ($M = 24.21, SD = 9.18$). The effect of the interaction between motivational orientation and functionality on originality remained significant when controlling for fluency, $F(1,73) = 5.77, p = .019, \eta^2 = .07$. 

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Motivated Creativity

Table 3.1. 

*Originality and flexibility (+SD) in Experiment 3.1*

<table>
<thead>
<tr>
<th></th>
<th>High functionality</th>
<th>Low functionality</th>
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<tbody>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td>Originality</td>
<td>.81 (.043)</td>
<td>.82 (.031)</td>
</tr>
<tr>
<td>Flexibility</td>
<td>8.50 (2.31)</td>
<td>7.86 (2.21)</td>
</tr>
<tr>
<td>Persistence</td>
<td>.19 (.213)</td>
<td>.29 (.238)</td>
</tr>
<tr>
<td>Fluency</td>
<td>29.22 (12.45)</td>
<td>27.64 (11.19)</td>
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</table>

Discussion

The results of Experiment 3.1 supported Hypothesis 1 revealing that avoidance motivation evoked a relatively persistent processing style whereas approach motivation evoked a relatively flexible processing style. In line with our *Conservation of Energy Account* and supporting Hypothesis 2, the results further revealed that functionality of creativity is an important motivator and stimulates creativity among avoidance motivated individuals. The effect of motivational-orientation on processing styles emerged irrespective of creative functionality, suggesting that the enhanced creativity among avoidance motivated individuals when creativity was functional was not caused by an altered, more flexible, processing style. From this it follows that avoidance motivated individuals compensated for their (relatively ineffective) persistent processing style by investing more energy and effort when creativity was functional. Rather than working differently, avoidance motivated individuals worked harder when creative performance helped goal attainment.

Experiments 3.2a and 3.2b

Experiments 3.2a and 3.2b were designed to go beyond the finding that functionality of creativity stimulates creativity among avoidance motivated individuals, by testing our hypotheses that creative performance is more difficult and depleting for avoidance rather than approach motivated individuals. We used a different idea generation task, induced approach versus avoidance motivation, and manipulated whether creativity was functional toward goal progress or not. We expected that participants would create more original words during a word puzzle when the puzzle was functional than when it was not, especially when an avoidance rather than an
Approach and Avoidance Motivation in Creativity

approach motivation was activated (Hypothesis 2). Moreover, we expected that participants in the avoidance-condition would experience the creative task as more difficult (Hypothesis 3) and would feel more depleted after creative performance than those in the approach-condition (Hypothesis 4). We tested the robustness of these hypotheses by testing them both in a setting in which we did not explicitly instruct participants to be original (Experiment 3.2a) and in a setting in which we did explicitly instruct participants to be original (Experiment 3.2b), because previous work has shown that instructing or rewarding people explicitly to be creative increases originality (e.g., Eisenberger & Rhoades, 2001; Runco, 2004).

Method

Participants and design. Seventy-one students (39 women, $M_{age} = 22.2$, $SD = 5.8$) in Experiment 3.2a, and 69 students (46 women, $M_{age} = 21.9$, $SD = 4.9$) in Experiment 3.2b were randomly assigned to the conditions of a 2 (functional vs. nonfunctional) x 2 (motivational orientation: approach vs. avoidance) factorial design. Dependent variables were originality (uniqueness of generated words) and self-reported depletion.

Procedure and experimental tasks. Upon arrival in the laboratory, participants were seated in individual cubicles behind a personal computer which displayed all materials and recorded all responses. Participants read and signed an informed consent, and proceeded by filling out a number of unrelated questionnaires. Then, they were introduced to the main experimental tasks which involved two puzzles: one in which they had to create new words from the letters of two given words (e.g. spicy – board: icy, boy, road, etc.), and one in which they had to detect words in a large grid with letters in rows and columns. The task was fully presented in Dutch. The originality of the words created in the first puzzle served as a measure of creativity (for a similar task see Oberauer, Süss, Wilhelm, & Wittmann, 2008; Süss et al., 2002).

Half the participants needed the words they created in the first puzzle to solve the second puzzle, the other half did not. In the functional condition, words that were created in the first puzzle and that were hidden in the second puzzle appeared on a list with words that the participants needed to find in the letter grid puzzle (making it easier to solve). For example, if the word ‘road’ was hidden in the second puzzle and participants had created the word ‘road’ in the first puzzle, it appeared on the list. If they had not created the word ‘road’ in the first puzzle only a row of x’s (‘xxxx’) appeared on the list (see Figure 3.1 for an example). For participants in the nonfunctional condition the two puzzles were independent.
Figure 3.1. In Experiment 3.2a and 3.2b participants needed (when creativity was functional) or did not need (when creativity was not functional) the words they created in the first puzzle to solve the second puzzle.

To manipulate motivational orientation, participants received instructions framed in approach terms (“Try to find as many words as possible”), or avoidance terms (“Try to miss as few words as possible”) in Experiment 3.2a, and in approach terms (“Try to find words that are original and unusual”) or avoidance terms (“Try not to miss words that are original or unusual”) in Experiment 3.2b. Similar framing manipulations are commonly used in work on approach-avoidance motivation in general (e.g., Förster, Higgins, & Idson, 1998; Sherman, Mann, & Updegraff, 2006) and on creative performance in particular (e.g., Friedman, 2009).

**Dependent variables.** Participants had up to six minutes to work on the first puzzle, but could stop earlier when they felt that they were done. Creativity was measured as the originality of the words that participants created. As in Experiment 3.1, the originality score was calculated for each word as: 1 – (percentage of participants that came up with the word / 100). For each participant an originality index was computed by calculating the average originality score across all generated words.

After completing the first word puzzle, depletion was assessed with four items. Participants indicated on a 1 (not at all) to 7 (very much) scale how tired, weary, depleted, and energetic (reverse coded) they felt at the moment (Cronbach’s α = .77 in both Experiments 3.2a and 3.2b). On the same scale, participants also indicated how difficult the puzzle was and how much they enjoyed solving the puzzle. Then they continued with the second puzzle, after which they were debriefed and paid for their participation.
Results Experiment 3.2a

**Originality.** A 2 (functional vs. nonfunctional) x 2 (motivational orientation: approach vs. avoidance) Analysis of Variance revealed a main effect for functionality, $F(1,67) = 6.94, p = .010, \eta^2 = .09$, showing that more original words were created in the functional condition ($M = .79, SD = .04$) than in the nonfunctional condition ($M = .76, SD = .06$). This effect was qualified by an interaction between functionality and motivational orientation, $F(1,67) = 8.03, p = .006, \eta^2 = .11$. A simple effects analysis revealed that participants in the avoidance-condition were more original when the puzzle was functional than when it was not functional, $F(1,68) = 10.97, p = .001$. Among participants in the approach-condition, however, functionality did not influence originality, $F(1,68) = .29, p = .592$. The means and standard deviations of all dependent variables in Experiment 3.2a are displayed in Table 3.2. These results support Hypothesis 2 that functionality of creativity increases creativity more among avoidance rather than approach motivated individuals.

**Cognitive costs.** Participants in the avoidance-condition reported that the word puzzle was more difficult ($M = 5.86, SD = 1.18$) than participants in the approach-condition ($M = 4.23, SD = 1.80$), $F(1,67) = 19.71, p < .001, \eta^2 = .23$. Neither the effect of functionality nor the interaction reached significance. This supports the idea that the cognitive costs for being creative are higher for avoidance motivated individuals than for approach motivated individuals. It further supports Hypothesis 3 that creative tasks are more difficult for avoidance rather than approach motivated individuals. Furthermore, participants in the avoidance-condition also reported more depletion ($M = 2.85, SD = 1.13$) than participants in the approach-condition ($M = 2.26, SD = 1.11$), $F(1,67) = 4.63, p = .035, \eta^2 = .07$. As predicted, this effect was qualified by an interaction effect, $F(1,67) = 4.69, p = .034, \eta^2 = .07$, indicating that the effect of functionality was stronger in the avoidance-condition rather than the approach-condition.

We expected that the effect of functionality on experienced depletion would be mediated by originality in the avoidance-condition (Hypothesis 4). In order to test for mediation, we followed the recommendations of Preacher and Hayes (2004), who suggest using a bootstrapping procedure to compute a confidence interval around the indirect effect (i.e., the path through the mediator). If zero falls outside this interval,

---

3 One may think that creative tasks would be perceived as particularly difficult by avoidance motivated individuals when the task is functional. However, we expected that creativity tasks would be difficult for them regardless of functionality, because their persistent processing style hinders creativity. Only when creativity is functional we found that (even though the task was difficult for them), avoidance motivated individuals exerted more effort which resulted in higher creativity but also higher depletion.
mediation can be concluded. Using the SPSS macros provided by Preacher and Hayes, we defined creative functionality as the independent variable, depletion as the dependent variable, and originality as the mediator (Nboot = 5000; Preacher & Hayes, 2008). In the avoidance-condition, the 95% confidence interval ranged from -1.14 to -0.169 (\( B_{\text{boot}} = -0.550, SE_{\text{boot}} = 0.244 \)). The fact that zero falls outside this interval indicates a significant mediation effect, \( p < .05 \). Performing the same analysis for the approach-condition did not reveal mediation, as the confidence interval did include zero (\( B_{\text{boot}} = -0.013, SE_{\text{boot}} = 0.107; 95\% \text{ CI} = [-0.245, 0.199] \)). As predicted in Hypothesis 4, avoidance (but not approach) motivated individuals exert more effort to be creative and thus feel more depleted when creativity serves goal progress rather than not.

**Fluency and enjoyment.** There were no main effects of motivational orientation and functionality on fluency (the number of words people created). The interaction between motivational orientation and functionality approached significance, \( F(1,67) = 3.90, p = .053, \eta^2 = .06, \) but controlling for fluency did not affect the interaction between motivational orientation and functionality on originality, \( F(1,67) = 4.20, p = .044, \eta^2 = .06. \) There were no effects of motivational orientation and functionality on task enjoyment.

<table>
<thead>
<tr>
<th>Table 3.2.</th>
<th>Originality, experienced feelings of depletion and task difficulty (+SD) in Experiment 3.2a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creativity is functional</td>
</tr>
<tr>
<td></td>
<td>Approach</td>
</tr>
<tr>
<td>Originality</td>
<td>.79 (.042)</td>
</tr>
<tr>
<td>Depletion</td>
<td>2.04 (1.07)</td>
</tr>
<tr>
<td>Difficulty</td>
<td>4.05 (1.78)</td>
</tr>
<tr>
<td>Fluency</td>
<td>41.53 (19.09)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>3.56 (2.13)</td>
</tr>
</tbody>
</table>
Results Experiment 3.2b

Originality. In this experiment we explicitly instructed participants to be original, and indeed, participants were on average more original in Experiment 3.2b ($M = .83, SD = .06$) than in Experiment 3.2a ($M = .78, SD = .05$). Furthermore, a 2 (functional vs. nonfunctional) x 2 (motivational orientation: approach vs. avoidance) Analysis of Variance revealed a main effect for functionality, $F(1,65) = 11.23, p = .001, \eta^2 = .15$, showing higher originality in the functional condition ($M = .85, SD = .04$) than the nonfunctional condition ($M = .81, SD = .06$). The main effect for motivational orientation was also significant, $F(1,65) = 26.23, p < .001, \eta^2 = .29$, showing that participants in the approach-condition ($M = .86, SD = .04$) were more original than participants in the avoidance-condition ($M = .80, SD = .06$). These effects were qualified by an interaction between functionality and motivational orientation $F(1,65) = 10.37, p = .002, \eta^2 = .14$. A simple effects analysis revealed that participants in the avoidance-condition were more original when the puzzle was functional rather than not, $F(1,66) = 13.27, p = .001$. Among participants in the approach-condition functionality did not influence originality, $F(1,66) = .03, p = .870$. For the means and standard deviation of all dependent variables, see Table 3.3. The pattern of results replicated the findings of Experiment 3.2a, and provided further support for Hypothesis 2 that functionality promotes creativity more among avoidance motivated individuals than among approach motivated individuals.

Cognitive costs. As predicted in Hypothesis 3, participants in the avoidance-condition reported that the word puzzle was more difficult ($M = 4.79, SD = 2.03$) than participants in the approach-condition ($M = 3.17, SD = 2.07$), $F(1,65) = 10.68, p = .002, \eta^2 = .14$. The effects of functionality and the interaction were not significant. In addition, participants in the avoidance-condition ($M = 2.82, SD = .89$) reported more depletion than participants in the approach-condition ($M = 2.27, SD = .81$), $F(1,65) = 7.06, p = .010, \eta^2 = .10$. As predicted, this effect was qualified by an interaction effect, $F(1,65) = 3.46, p = .067$ (marginal), $\eta^2 = .05$, showing that the effect of functionality was stronger in the avoidance-condition than in the approach-condition.

We tested whether the effect of functionality on depletion was mediated by originality as in Experiment 3.2a. In the avoidance-condition the confidence interval did not include zero, indicating that the effect was statistically significant at the .05 level ($B_{boot} = -0.771, SE_{boot} = .227; 95\% CI = [-1.138, -0.323]$). The same analysis for the approach-condition did not reveal mediation, as the confidence interval did include zero ($B_{boot} = .011, SE_{boot} = .084; 95\% CI = [-.147, .208]$). This supports Hypothesis 4, that avoidance (but not approach) motivated individuals have to exert more effort in order
to be creative and thus feel more depleted when creativity serves goal progress than when it does not.

**Fluency and enjoyment.** There were no main effects of motivational orientation and functionality on fluency. The interaction between motivational orientation and functionality marginally predicted fluency, $F(1,65) = 3.03, p = .086, \eta^2 = .05$. The interaction-effect between motivational orientation and functionality on originality remained significant when controlling for fluency, $F(1,65) = 7.63, p = .007, \eta^2 = .11$. There were no effects of motivational orientation and functionality on task enjoyment.

Table 3.3.
*Originality, experienced feelings of depletion and task difficulty (+SD) in Experiment 3.2b*

<table>
<thead>
<tr>
<th></th>
<th>Creativity is functional</th>
<th>Creativity is not functional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td>Originality</td>
<td>.86 (.044)</td>
<td>.84 (.038)</td>
</tr>
<tr>
<td>Depletion</td>
<td>2.10 (.64)</td>
<td>3.02 (1.05)</td>
</tr>
<tr>
<td>Difficulty</td>
<td>3.22 (2.10)</td>
<td>4.47 (1.85)</td>
</tr>
<tr>
<td>Fluency</td>
<td>34.39 (12.49)</td>
<td>35.47 (15.28)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>4.89 (1.71)</td>
<td>4.88 (1.65)</td>
</tr>
</tbody>
</table>

**Discussion**

Experiment 3.1, 3.2a and 3.2b show that functionality of creativity is an important motivator which stimulates creativity especially among avoidance motivated individuals, supporting our *Conservation of Energy Account*. While approach motivated individuals were original regardless of functionality, avoidance motivated individuals needed the additional motivator. However, although functionality increased originality among avoidance motivated individuals, it came at a cost: Creative performance was difficult for avoidance motivated individuals who had to exert more effort in order to generate original ideas and were subsequently more depleted.
Experiment 3.3

One implication of these findings is that goal-achievement should have a stronger impact on the level of creativity among avoidance rather than approach motivated individuals. To test this idea, participants in Experiment 3.3 did the same two word puzzles as before, but contrary to Experiments 3.2a and 3.2b the first puzzle was functional to solving the second puzzle for all participants. Halfway through the first puzzle, half the participants received feedback that they were close to reaching their goal (implying that the puzzle lost some of its functionality). The other half did not receive this feedback. We expected that participants in the avoidance-condition would cease to be original after receiving feedback that they were close to reaching their goal because for them creativity is costly and more contingent upon it being functional. We therefore also expected that avoidance motivated participants who received this feedback would experience less depletion after finishing the task compared with avoidance motivated participants who did not receive such feedback. Participants in the approach-condition, however, should be influenced less by getting close to their goal, and we expected them to be original even when they learned they were close to reaching their goal. Finally, in Experiment 3.3, we added a check for the motivational orientation manipulation.

Method

Eighty-one students (51 women, $M_{age} = 22.0$, $SD = 5.9$) were randomly assigned to the conditions of a 2 (motivational orientation: approach vs. avoidance) x 2 (feedback vs. no feedback) factorial design. The task and procedure were similar to Experiment 3.2a. Participants worked six minutes on the first puzzle in which they created words with the letters of two other words, and could not quit the task before the time elapsed. After three minutes, participants received feedback notifying that they were halfway and had three more minutes to work on the puzzle. Additionally, participants in the feedback-condition (but not in the no-feedback-condition) were notified that, considering the number of words they had generated thus far, they had a good chance of solving the subsequent letter grid puzzle.

After completing the first puzzle, depletion (Cronbach’s $\alpha = .71$), task difficulty, and enjoyment were measured as before. To check the manipulation of motivational orientation we included a Word Completion Task in which participants were asked to complete words by filling in missing letters. This task is based on the idea that “approach motivation may be defined as the energization of behavior by, or the
direction of behavior toward, positive stimuli (objects, events, possibilities), whereas avoidance motivation may be defined as the energization of behavior by, or the direction of behavior away from, negative stimuli (objects, events, possibilities)” (Elliot, 2008, p. 3). In our Word Completion Task, six words could be completed in an approach-related way, referring to getting closer to, or achieving positive outcomes (e.g., berei.en could be completed as bereiken – Dutch for ‘to achieve’), or in a neutral, not goal-related way (bereiden – ‘to cook’). The other approach-words were: behalen vs. betalen (to gain vs. to pay), winnen vs. winkel (to win vs. store), doel vs. doek (goal vs. cloth), prijs vs. grijis (price vs. gray), and streven vs. strepen (to strive vs. stripes). Six words could be completed in an avoidance related way, referring to getting away from, or avoiding negative outcomes (e.g., ontw.ken could be completed as ontwij.ken – to evade) or in a neutral, not goal-related way (e.g., ontwa.ken – to wake up). The other avoidance-words were: vermij.ken vs. vermoed.en (to avoid vs. to suppose), missen vs. vissen (to miss vs. to fish), voorkomen vs. voornemen (to prevent vs. intention), afgaan vs. uitgaan (to flop vs. to go out), and ver.heel.zen vs. verkie.zen (to lose vs. to choose). Some of the uncompleted words could be finished in more than one neutral way. We counted the number of words completed in an approach-related manner as an index of approach motivation, and the number of words completed in an avoidance-related manner as an index of avoidance motivation (both range between 0 and 6).

To check the adequacy of the functionality manipulation, participants were asked to indicate to what extent performance on the first puzzle was related to performance on the second puzzle on a scale ranging from 1 (not at all) to 7 (very much). Finally, they were asked to indicate on the same scale whether they received feedback halfway the first puzzle that indicated they had a good chance of solving the second puzzle.

Results

Manipulation checks. In the approach-condition words were more often completed in an approach related way ($M = 2.60, SD = 1.04$) than in the avoidance-condition ($M = 2.10, SD = .88$), $F(1,77) = 5.70, p = .019, \eta^2 = .07$. In the avoidance-condition words were more often completed in an avoidance related way ($M = 2.72, SD = .86$) than in the approach-condition ($M = 2.29, SD = .97$), $F(1,77) = 4.61, p = .035, \eta^2 = .06$. The feedback manipulation alone or in interaction with motivational motivation did not influence the manipulation check, indicating that the manipulation of motivational orientation was successful.
Participants correctly identified that performance on the first puzzle was related to performance on the second puzzle, $M = 5.79$, $SD = 1.12$, which is significantly higher than the midpoint of the 7-point scale, $t(80) = 22.52$, $p < .001$. They also understood the feedback they received during the first puzzle and all participants answered correctly that they did (or did not) receive performance feedback.

**Originality.** A 2 (motivational orientation: approach vs. avoidance) x 2 (feedback vs. no feedback) x 2 (time: performance in first three minutes vs. performance in the second three minutes) Analysis of Variance with the last factor within-subjects, revealed a main effect for time. Participants were more original in the second three minutes ($M = .83$, $SD = .07$) than in the first three minutes ($M = .74$, $SD = .05$), $F(1,77) = 166.19$, $p < .001$, $\eta^2 = .68$, suggesting that less original words are the ones that come to mind easier and earlier. The same analysis also revealed a main effect of feedback, showing that participants who did not receive feedback ($M = .80$, $SD = .04$) were on average more original than participants who received feedback ($M = .77$, $SD = .05$), $F(1,77) = 8.21$, $p = .005$, $\eta^2 = .10$, and a main effect of motivational orientation, showing that participants in the approach-condition ($M = .80$, $SD = .03$) were more original than participants in the avoidance-condition ($M = .77$, $SD = .05$), $F(1,77) = 7.77$, $p = .007$, $\eta^2 = .09$.

As expected, these effects were qualified by a three-way interaction, $F(1,77) = 4.22$, $p = .043$, $\eta^2 = .05$. A simple effects analysis revealed an interaction between approach vs. avoidance and time when feedback was provided, $F(1,78) = 7.41$, $p = .008$, but no interaction when no feedback was provided, $F(1,78) = .01$, $p = .938$. An additional simple effects analysis with the difference in originality between the first and the second three minutes ($\Delta_{originality}$) as dependent variable, revealed that the originality of participants in the approach condition was not affected by functionality, $F(1,78) = .25$, $p = .620$, but that the originality of participants in the avoidance condition was affected by functionality, $F(1,78) = 10.26$, $p = .002$. This further corroborates the findings of Experiment 3.2a and 3.2b that showed that functionality stimulates originality among avoidance motivated individuals, by showing that the originality of avoidance motivated individuals is inhibited more than the originality of approach motivated individuals when task functionality is reduced. When performance on the puzzle became less functional towards goal progress, participants in the avoidance-condition became less original. For the means and standard deviation of all dependent variables, see Table 3.4.
Cognitive costs. Participants in the avoidance-condition reported that the word puzzle was more difficult ($M = 4.90$, $SD = 1.67$) than participants in the approach-condition ($M = 3.95$, $SD = 2.15$), $F(1,77) = 4.77$, $p = .032$, $\eta^2 = .06$. The effect of functionality and the interaction effect were not significant. These results support Hypothesis 3 that creative tasks are more difficult for avoidance rather than approach motivated individuals. Furthermore, participants in the avoidance-condition reported being more depleted ($M = 2.98$, $SD = 1.03$) than participants in the approach-condition ($M = 2.16$, $SD = .90$), $F(1,77) = 15.89$, $p < .001$, $\eta^2 = .17$, see Table 3.3. As expected, this effect was qualified by an interaction between motivational orientation and feedback, $F(1,77) = 9.21$, $p = .003$, $\eta^2 = .11$, showing that the effect of feedback was stronger in the avoidance-condition than in the approach-condition.

To further test the hypothesis that participants in the avoidance condition exerted less effort after receiving feedback that they were close to goal achievement, and therefore were less original in the second three minutes, we tested whether the effect of feedback on depletion was mediated by originality in the second three minutes by generating bootstrap confidence intervals ($N_{\text{boot}} = 5000$). In the avoidance-condition the confidence interval did not include zero, indicating that the effect was statistically significant at the .05 level ($B_{\text{boot}} = .355$, $SE_{\text{boot}} = .216$; 95% CI = [.029, .912]). The same analysis for the approach-condition did not reveal mediation, as the confidence interval did include zero ($B_{\text{boot}} = -.006$, $SE_{\text{boot}} = .050$; 95% CI = [-.045, .147]). This supports Hypothesis 4, by suggesting that participants in the avoidance-condition kept exerting effort when they did not receive feedback that they were close to goal achievement (and thus generating words continued to be functional), leading to higher originality but also greater depletion.

Fluency and enjoyment. We found no main effect of functionality on fluency, and no interaction effect. There was a main effect of motivational orientation, $F(1,77) = 6.87$, $p = .011$, $\eta^2 = .08$, showing that participants in the approach-condition created more words ($M = 49.29$, $SD = 15.57$) than those in the avoidance-condition ($M = 40.41$, $SD = 14.09$). The three-way interaction between motivational orientation, functionality, and time, on originality remained significant when controlling for fluency, $F(1,76) = 4.14$, $p = .045$, $\eta^2 = .05$. There were no effects of motivational orientation and functionality on task enjoyment, $F$'s < 1.0.
Table 3.4.  
Originality, experienced feelings of depletion and task difficulty (+SD) in Experiment 3.3

<table>
<thead>
<tr>
<th></th>
<th>No feedback</th>
<th>With feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td>Originality during 1st half</td>
<td>.75 (.039)</td>
<td>.73 (.046)</td>
</tr>
<tr>
<td>Originality during 2nd half</td>
<td>.86 (.060)</td>
<td>.85 (.061)</td>
</tr>
<tr>
<td>Depletion</td>
<td>1.99 (.58)</td>
<td>3.42 (.96)</td>
</tr>
<tr>
<td>Difficulty</td>
<td>4.00 (2.02)</td>
<td>4.89 (1.41)</td>
</tr>
<tr>
<td>Fluency</td>
<td>49.68 (16.50)</td>
<td>40.35 (13.43)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>5.74 (.87)</td>
<td>5.50 (1.40)</td>
</tr>
</tbody>
</table>

Discussion

The results of the first three experiments supported the hypothesis derived from our Conservation of Energy Account that creative functionality enhances the creativity of avoidance motivated individuals more than that of approach motivated individuals (Experiments 3.1, 3.2a, and 3.2b) and after functionality was reduced, avoidance motivated individuals became less creative (Experiment 3.3). We found evidence suggesting that avoidance motivation induces a relatively persistent cognitive processing style and approach motivation a relatively flexible cognitive processing style (Experiment 3.1), and that creative performance is more difficult and depleting for avoidance rather than approach motivated individuals (Experiments 3.2a, 3.2b, and 3.3).

Experiment 3.4

In Experiment 3.4 we sought to conceptually replicate the findings of the first three experiments, by using a different paradigm and creativity task. Instead of examining original idea generation, Experiment 3.4 focused on creative insight. Creative insights involve a moment of realization, a sudden comprehension – an “Aha! moment” (Kounios & Beeman, 2009; Sternberg & Davidson, 1995). For creative insights, people have to abandon pre-existing assumptions and look at old information in a new
way (Kershaw & Ohlsson, 2004), they have to “break-set” in order to get a flash of insight (Duncker, 1945; Smith & Kounios, 1996). We used the Remote Associates Test (RAT; Mednick, 1962) to measure creative insight (see e.g., Ansburg & Hill, 2003; Griskevicius et al., 2006; Sligte et al., 2011). In the RAT participants have to find words that are associated with three other words (e.g. club, gown, mare – night). The first, most easily accessible associate to each of the words is often not correct (i.e., it is not associated with all the other words) therefore the solver must think of more distantly related information to connect the three words (Mednick, 1962; Schooler & Melcher, 1995).

A second goal of Experiment 3.4 was to probe more fully the mechanism underlying the effects of functionality and approach versus avoidance motivation on creativity. We hypothesized that avoidance motivated individuals, more than approach motivated individuals, achieve creative outcomes through cognitive effort. If true, then avoidance motivated individuals should depend more on working memory than approach motivated individuals, and one reason why they feel depleted is that they have engaged in effortful top-down control. To test this hypothesis, we manipulated motivational orientation and participants completed a creative insight task that was functional (or not) under a low (or high) cognitive load. We predicted that under a low cognitive load avoidance motivated individuals would perform better on the RAT when it was functional rather than not, and that under a high cognitive load avoidance motivated individuals would perform rather poorly on the RAT irrespective of functionality (Hypothesis 5).

**Method**

One-hundred and forty-three students (101 women, \( M_{age} = 21.1, SD = 3.6 \)) were randomly assigned to one of the 2 (functional vs. nonfunctional) x 2 (motivational orientation: approach vs. avoidance) x 2 (low cognitive load vs. high cognitive load) conditions. The study was presented as a multitasking assignment in which participants simultaneously completed language and math related tasks. Participants started with five practice RAT items to become familiar with the task. Then they solved another ten practice RAT items, and while solving these, participants had to memorize one digit numbers to become familiar with the dual character of the task. The number was displayed on the screen before the RAT item appeared and participants had to type in the number after completing the RAT item. After the practice session the actual task started, in which the participants completed 10 moderately difficult RAT items (see Harkins, 2006; Isen, Daubman, & Nowicki, 1987; McFall, Jamieson, & Harkins, 2009) while memorizing a two digit number (low cognitive load) or a five digit number (high cognitive load).
cognitive load). It was assumed that the two digit number would occupy working memory less than the five digit number, and that the memorizing the five digit number would be difficult but not fully occupy working memory (see Baddeley, 2003; De Dreu et al., 2012; Van Dillen & Koole, 2007).

The manipulation of motivational orientation and functionality were based on the mouse-in-maze task (see Friedman & Förster, 2001). In this task participants are asked to lead a mouse out of a maze. In the approach-condition a piece of cheese is lying near the maze exit, whereas in the other avoidance-condition an owl is depicted flying over the maze. In the present experiment, during the ‘multitask’ practice trials as well as during the actual experimental trials, a mouse appeared on the left side of the screen and a piece of cheese (approach) or an owl (avoidance) appeared on the right side of the screen (see Figure 3.2). In the functional condition, the cheese moved closer to the mouse when a RAT item was answered correctly (approach-condition) or the owl moved closer to the mouse when a RAT item was answered incorrectly (avoidance-condition). In the nonfunctional condition, the cheese or owl moved randomly after giving an answer, irrespective of RAT performance.

![Figure 3.2](image)

*Figure 3.2. In Experiment 3.4 participants could (when the task was functional) or could not (when the task was not functional) influence the cheese (or owl) moving closer to the mouse by correctly solving insight problems.*

The number of correctly solved RAT items (range between 0 and 10) was used as a measure of creative insight, and the number of correctly recalled numbers (range between 0 and 10) was counted. After the multitask assignment, participants completed the Word Completion Task as a manipulation check for motivational orientation. Finally, to assess whether participants understood that performance on the RAT was functional (or not), they were asked to indicate on a scale ranging from 1 (not
at all) to 7 (very much) whether their performance on the RAT influenced the movement of the cheese (or owl), and whether their performance on the number recall task influenced the movement of the cheese (or owl).

Results

Manipulation checks. In the approach-condition words with missing letters were more often completed in an approach related way ($M = 2.29$, $SD = 1.01$) than in the avoidance-condition ($M = 1.87$, $SD = .99$), $F(1,135) = 6.15$, $p = .014$, $\eta^2 = .04$. In the avoidance-condition words were more often completed in an avoidance related way ($M = 3.86$, $SD = 1.64$) than in the approach-condition ($M = 2.44$, $SD = 1.19$), $F(1,135) = 36.90$, $p < .001$, $\eta^2 = .22$. There were no effects from the functionality manipulation or the load manipulation on the manipulation check, indicating a successful manipulation of motivational orientation.

Most participants correctly identified that performance on the RAT did (or did not) influence the movement of the cheese or owl. All participants in the functional condition recognized that insight performance was functional (100%; $n = 72$), and most participants in the nonfunctional condition recognized that it was not (92%; 65 out of 71). All participants in the functional condition recognized that recalling the numbers (from the load manipulation) was not functional (100%; $n = 72$), as did most participants in the nonfunctional condition (96%; 68 out of 71). Even though participants understood that number recall did not promote getting closer to the cheese (or away from the owl), they took the recall task seriously and recalled on average 7.81 out of 10 numbers correctly. Only the load manipulation influenced the number of correct recalls; not surprisingly, participants correctly recalled two digit numbers more often ($M = 8.26$, $SD = 1.42$) than five digit numbers ($M = 7.39$, $SD = 2.11$), $F(1,135) = 8.36$, $p = .004$, $\eta^2 = .06$, see Table 3.5. Functionality and motivational orientation did not influence the number of correct recalls, $Fs < 1$.

Creative insight. A 2 (functional vs. not-functional) x 2 (motivational orientation: approach vs. avoidance) x 2 (low cognitive load vs. high cognitive load) Analysis of Variance revealed that participants in the low load condition ($M = 5.52$, $SD = 1.07$) solved more RAT items than participants in the high load condition ($M = 4.96$, $SD = 1.31$), $F(1,135) = 10.11$, $p = .002$, $\eta^2 = .07$, indicating that the cognitive load manipulation was successful. As expected, it was harder to solve these insight problems under a high cognitive load than under a low cognitive load. Furthermore, participants in the approach-condition ($M = 5.53$, $SD = 1.28$) solved more RAT items than participants in the avoidance-condition ($M = 4.86$, $SD = 1.05$), $F(1,135) = 12.74$, $p < .001,$
η² = .09. Importantly, these main effects were qualified by a three-way interaction between functionality, motivational orientation, and load, $F(1,135) = 3.80, p = .053, η² = .03$.

A simple effects analysis revealed an interaction between motivational orientation and functionality when cognitive load was low, $F(1,140) = 5.38, p = .022$, but no interaction when cognitive load was high, $F(1,140) = .27, p = .602$. Under a low cognitive load the results of Experiments 3.1 and 3.2 were replicated. Supporting Hypothesis 2, participants in the avoidance-condition performed better on the RAT when it was functional ($M = 5.81, SD = .83$) than when it was not functional ($M = 4.69, SD = .79$), $F(1,66) = 10.04, p = .002$. Participants in the approach-condition, however, performed well on the RAT whether it was functional ($M = 5.65, SD = 1.06$) or not ($M = 5.85, SD = 1.14$), $F(1,66) = .53, p = .470$. In contrast, under a high cognitive load, functionality did not affect insight performance in the approach-condition, $F(1,71) = .06, p = .815$, however, functionality did not improve performance in the avoidance-condition either, $F(1,71) = .15, p = .697$.

Table 3.5.

RAT performance and number recall (+SD) in Experiment 3.4

<table>
<thead>
<tr>
<th></th>
<th>Low cognitive load</th>
<th></th>
<th>High cognitive load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RAT is functional</td>
<td>RAT is not functional</td>
<td>RAT is functional</td>
</tr>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
<td>Approach</td>
</tr>
<tr>
<td></td>
<td>Avoidance</td>
<td></td>
<td>Avoidance</td>
</tr>
<tr>
<td># Solved RAT items</td>
<td>5.65 (1.06)</td>
<td>5.81 (1.83)</td>
<td>5.36 (1.56)</td>
</tr>
<tr>
<td># Correctly recalled</td>
<td>9.35 (1.27)</td>
<td>7.94 (1.44)</td>
<td>7.68 (2.34)</td>
</tr>
<tr>
<td>numbers</td>
<td>5.85 (1.14)</td>
<td>4.69 (1.79)</td>
<td>4.41 (0.94)</td>
</tr>
<tr>
<td></td>
<td>8.20 (1.61)</td>
<td>8.56 (1.36)</td>
<td>7.38 (2.16)</td>
</tr>
<tr>
<td></td>
<td>7.39 (1.86)</td>
<td></td>
<td>7.29 (1.86)</td>
</tr>
</tbody>
</table>
Discussion

The results of Experiment 3.4 provided further support to the idea that the cognitive costs for being creative are higher for avoidance rather than approach motivated individuals. In the first three experiments we found evidence that functionality of creative performance stimulates creativity when people are avoidance motivated. Importantly, such creative performance is relatively difficult and depleting for them. The results of Experiment 3.4 extend these findings and provide support to Hypothesis 5, showing that avoidance motivated individuals need more cognitive resources than approach motivated individuals for creative insights, and when these resources are consumed (here due to the load manipulation) their performance on creative tasks suffers.

General Discussion

Creativity can be functional and help to reach goals, such as pursuing a successful scientific career (Csikszentmihalyi, 1996) or impressing a potential dating partner (Griskevicius et al., 2006). Previous research suggests that not all goals stimulate creativity to the same extent, and that striving for positive outcomes stimulates creativity more than avoiding negative outcomes (e.g., Friedman & Förster, 2002, 2005a). However, building on the Dual Pathway to Creativity Model (De Dreu et al., 2008), we showed that avoidance motivated individuals can be as creative as approach motivated individuals, but that it is relatively difficult, depleting, and requires the availability of sufficient working memory capacity. Specifically, we found that when creativity was functional to avoiding negative outcomes, avoidance motivated individuals were stimulated to exert the necessary effort and they were more original (Experiments 3.1, 3.2a, 3.2b, and 3.3) and solved more creative insight problems (Experiment 3.4) than when creativity was not functional. Approach motivated individuals’ originality and creative insight performance did not depend on functionality.

We also found evidence that avoidance motivation evokes a relatively persistent processing style, whereas approach motivation evokes a relatively flexible processing style (Experiment 3.1), that avoidance motivated individuals found the tasks more difficult than approach motivated individuals, and felt more depleted after creative performance (Experiments 3.2a, 3.2b, and 3.3). Finally, the stimulating effect of functionality on creativity among avoidance motivated individuals was attenuated when working under a high cognitive load (Experiment 3.4). It appears that to perform creatively avoidance motivated individuals need more working memory capacity and
engage in more effortful controlled processing. Being creative is more costly for avoidance than for approach motivated individuals, and avoidance motivated individuals may be more careful in selecting situations in which they exert the effort to be creative.

The present results have at least three theoretical implications: (a) for our thinking about the different cognitive-motivational processes underlying creative achievements; (b) for our thinking about the relationship between functionality of task performance and the extent to which this motivates creativity; and (c) for our understanding of the extent to which creative performance requires cognitive control and executive functioning. Here we address these implications in more detail, and discuss limitations and questions for new research.

**Theoretical Implications**

A first implication relates to the Dual Pathway to Creativity Model (De Dreu et al., 2008). This model has mainly been applied in the domain of mood. There have been speculations on application for approach and avoidance motivation, but this is the first direct evidence that approach motivation induces a flexible processing style and avoidance motivation a persistent processing style when working on creative tasks. Furthermore, we found that avoidance motivated individuals used a relatively persistent processing style compared with approach motivated individuals, irrespective of functionality of creativity toward goal progress and irrespective of the creativity of their output. This implies that the increased creativity among avoidance motivated individuals did not result from an altered processing style. Rather, the functionality of creative performance stimulated avoidance motivated individuals to exert effort into creative performance to compensate for their relatively inflexible processing style.

This finding can advance the research of the effect of goals on creativity, by indicating which mechanisms underlie these effects. For example, based on our findings we expect that people who become more creative when confronted with attractive potential partners (Griskevicius et al., 2006) use a relatively flexible cognitive style, whereas people in conflict situations (De Dreu & Nijstad, 2008) use a relatively persistent cognitive style. Furthermore, because the persistence pathway (as the name suggests) relies on effort, perseverance, and a systematic approach, we expected and found evidence that the persistence pathway to creativity is more effortful and leads to more cognitive depletion and fatigue than the flexibility pathway. We propose a *Conservation of Energy Account*, which has implications for the Dual Pathway to
Motivated Creativity

Creativity Model: People for whom a persistent cognitive style is activated, for example by avoidance motivation or a negative mood, (a) should carefully select situations in which they exert effort into creative performance, (b) should only be able to perform creatively in the absence of distractors (such as a cognitive load) and, (c) when they decide to exert effort into creative performance this leads to depletion.

A second implication concerns the effects of goal completion on creativity. In Experiment 3.3 participants received feedback that they were close to goal achievement. This feedback inhibited creativity among avoidance motivated individuals. This finding can be interpreted in terms of declined functionality making avoidance motivated individuals less prepared to invest effort. The idea is in line with the work of Baas et al. (2011a) that revealed that active goals stimulated creativity more among avoidance rather than approach motivated individuals. There is research showing that after goal achievement, motivation attenuates and goal related constructs become less readily accessible from memory (see Liberman, Förster, & Higgins, 2007; Moss, Kotovsky, & Cagan, 2007). We note that this did not appear to be the case for approach and avoidance tendencies. The manipulation check did not reveal a decline in approach or avoidance motivation for people who did (vs. did not) receive feedback that they were close to goal achievement. Rather, avoidance motivated participants were less prepared to invest effort. It is interesting that performance did not decline for approach motivated individuals after receiving performance feedback, which suggests that goal completion may not affect creative performance of approach motivated people all that much. Because avoiding failure or losses can be perceived as a necessity, compared with achieving success, which can be perceived as more of a luxury, our finding is in line with the findings of Koo and Fishbach (2008). They found that people for whom goal achievement is a necessity or need are less motivated by feedback that provides information on what they achieved to-date (as we did in Experiment 3.3) compared with people for whom goal achievement is related to luxury or desire (also see Fishbach & Finkelstein, 2011; Fishbach, Zhang, & Koo, 2009). Based on our findings we speculate that goal completion reduces effort, but not flexibility. Because creative performance of avoidance motivated individuals relies more on effort than that of approach motivated individuals, especially their creativity may diminish when they are (nearly) completing a goal.

Third, and finally, the present findings inform us about the importance of executive functioning in creative performance. In Experiment 3.4, availability of working memory capacity was manipulated through cognitive load. Limiting working memory capacity by engaging in an unrelated recall task while solving insight problems,
impaired creativity (i.e., fewer insight problems were solved) especially among avoidance motivated individuals. Indeed, recent work suggests that working memory capacity (both individual differences and manipulated through cognitive load) positively correlates with creative performance on a variety of measures (De Dreu et al., 2012; Süß et al., 2002). The present work refines this conclusion, by showing that working memory is especially essential for people who focus on avoiding negative outcomes and for whom creativity is an effortful endeavor. One would expect that the effects of functionality in our studies should only be found among people with a relatively high working memory capacity. For those with low working memory capacity, creative performance should be harder under an avoidance motivation than under an approach motivation regardless of functionality, because they may not have enough cognitive resources to exert the effort that is needed to be creative. Along the same line of reasoning, one would expect to obtain similar findings for individual differences in approach and avoidance temperament (see Elliot & Thrash, 2002): Functionality of creativity should increase creativity more for people who are high in avoidance temperament but should not increase creativity much for people high in approach temperament.

Limitations and Future Directions

One factor that may undermine creative performance of avoidance motivated individuals, besides their inflexible processing style, involves (lack of) intrinsic motivation. Goals that are framed in terms of avoidance of failure can undermine intrinsic motivation (Elliot & Harackiewicz, 1996), and rewards framed as possible non-gains (i.e., “if you do not perform well enough you will not receive a bonus”) may lead people to enjoy creative tasks less and feel pressured to perform well (Friedman, 2009). Following this idea, in the present research participants in the approach-conditions may have exerted more effort because they enjoyed the tasks more, and participants in the avoidance-conditions may only have exerted effort when their lack of intrinsic motivation was compensated by an extrinsic goal (i.e., in the functional conditions). However, two sets of findings run counter this possibility. First, in Experiments 3.2a, 3.2b, and 3.3 participants did not report less enjoyment in the avoidance than in the approach-conditions. Second, in Experiment 3.4, participants in the avoidance-conditions for whom creativity was functional had more creative insights when they were working under a low than a high cognitive load. This suggests that avoidance motivated individuals need more cognitive resources in order to be creative than approach motivated individuals. It thus seems that the often found lack of
creativity among avoidance motivated individuals cannot simply be explained by a lack of intrinsic motivation.

Another issue that may require new research concerns the relation between fluency and originality. Our core finding that avoidance motivation stimulates creativity when creative performance is functional and that approach motivation leads to creativity irrespective of functionality was independent of fluency. This indicates that the mere quantity of ideas cannot account for differences in originality. Although in previous research a relation has sometimes been found between persistent idea generation and increased fluency, we propose that this does not always have to be the case. Specifically, a recent meta-analysis (Nijstad et al., 2010) suggests that a persistent processing style may not necessarily lead to a higher number of ideas, but to a focus on specific categories that are explored in-depth (as opposed to generating only a few ideas in many different categories).

We note that the present experiments did not include a control condition in which neither approach nor avoidance motivation were manipulated. Research including such a control condition could tell us whether (a) avoidance motivated individuals are creative because it is functional, (b) if they are not creative when it is not functional, or (c) some combination of these two possibilities. However, because goals are inherently directed toward positive, or away from negative outcomes, it is not clear how such a control condition should be constructed.

**Conclusion**

For avoidance motivated individuals, it is important that creativity serves goal achievement. Avoidance motivated individuals are more creative when it is functional than when it is not, because for them creative performance is difficult, depleting, and requires working memory capacity. However, when creativity is needed to avoid negative outcomes, it may be profitable to bear these cognitive costs. Five experiments revealed that desperate needs lead to desperate deeds. Avoidance motivated individuals pay a price for being creative, but they readily pay the price when creativity serves a purpose and helps them to avoid negative outcomes.