Motivated creativity: A conservation of energy approach
Roskes, M.

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Motivated Creativity:
A conservation of energy approach

“Without a clear reason to be creative, approach motivated individuals outperform avoidance motivated individuals for whom creativity is effortful and depleting. As soon as a reason is provided, creativity prospers among all.”

Marieke Roskes

Invitation to the dissertation defense of Marieke Roskes

“Motivated Creativity
A conservation of energy approach”

Wednesday,
27 February 2013
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at the Agnietenkapel
Oudezijds Voorburgwal 231
1012 EZ Amsterdam

A reception will follow the ceremony.
Paranimfen
Daniël Sligte
djsligte@gmail.com
Linda Roskes
roskes_linda@hotmail.com

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MOTIVATED CREATIVITY:
A conservation of energy approach

Marieke Roskes
MOTIVATED CREATIVITY:
A Conservation of Energy Approach

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Promotor: Prof. Dr. C.K.W. de Dreu
Copromotor: Prof. Dr. B.A. Nijstad

Overige leden: Prof. Dr. A.E. Elliot
               Prof. Dr. N.W. van Yperen
               Prof. Dr. R.W. Holland
               Prof. Dr. G.A. van Kleef
               Dr. M. Baas

Faculteit der Maatschappij- en Gedragswetenschappen
## Contents

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter One</td>
<td>Motivated Creativity: An Introduction</td>
<td>7</td>
</tr>
<tr>
<td>Chapter Two</td>
<td>Avoidance Motivation and Conservation of Energy</td>
<td>23</td>
</tr>
<tr>
<td>Chapter Three</td>
<td>Necessity is the Mother of Invention: Avoidance Motivation Stimulates Creativity Through Cognitive Effort</td>
<td>31</td>
</tr>
<tr>
<td>Chapter Four</td>
<td>Time Pressure Undermines Performance more under Avoidance than Approach motivation</td>
<td>63</td>
</tr>
<tr>
<td>Chapter Five</td>
<td>Understanding Creative Processes Affects Creativity Judgments</td>
<td>85</td>
</tr>
<tr>
<td>Chapter Six</td>
<td>General Discussion</td>
<td>95</td>
</tr>
<tr>
<td>References</td>
<td></td>
<td>109</td>
</tr>
<tr>
<td>Summary</td>
<td></td>
<td>131</td>
</tr>
<tr>
<td>Samenvatting</td>
<td></td>
<td>139</td>
</tr>
<tr>
<td>Dank</td>
<td>Thanks</td>
<td>147</td>
</tr>
</tbody>
</table>
Chapter One

Motivated Creativity: An Introduction
Motivated Creativity

When making a financial investment, one can consider the chance of a company flourishing and growing and giving a great return on the investment, or the risk of the company failing and losing one's investment. When deciding what to study after finishing high school, one can consider how interesting the topic of a particular study is and how fun the jobs are that the study prepares for, or how difficult the study is and how unlikely it is to get a job afterwards. When searching for a nice date, one can focus on finding someone with great qualities, or on avoiding people with negative qualities. These examples illustrate how people sometimes strive to achieve success or positive outcomes and at other times strive to avoid failure or negative outcomes.

Does it matter which goals people strive for? Does striving for success lead to better performance than striving to avoid failure? Does striving for positive or avoiding negative outcomes improve performance on different types of tasks? How does working under pressure influence people striving for these different types of goals? Is goal-striving more difficult when striving to avoid negative outcomes than when striving for positive outcomes? This dissertation addresses these and related questions, and advocates a novel conservation of energy principle to explain when striving for positive outcomes (approach motivation) and striving to avoid negative outcomes (avoidance motivation) stimulate performance. This conservation of energy principle predicts that performance under avoidance motivation is more fragile and can be undermined more easily than performance under approach motivation, because performance under avoidance motivation relies more heavily on the recruitment of cognitive resources and cognitive control. Or, as put by Johan Cruijff, who used to be one of the greatest soccer players in the world and is known for his philosophical and often oracular one-liners; “Het is veel makkelijker om goed te spelen dan om te voorkomen dat je slecht speelt” (It is much easier to play well than to prevent playing badly; Winsemius, 2012).

The introduction of this dissertation first discusses the concepts of approach and avoidance motivation and the functions and biological foundation of these motivational orientations. Then, research on the consequences of these motivational orientations for behavior and cognition is reviewed, with a special emphasis on creative performance which is particularly difficult when people are avoidance motivated. Because approach motivation evokes flexible and associative thinking, and avoidance motivation evokes systematic and persistent thinking, avoidance motivation is often associated with inhibited creativity. However, we expect that avoidance motivated people can compensate for their systematic way of thinking by investing energy and effort, and
Introduction

achieve equally high levels of creative performance as approach motivated people. The dual pathway to creativity model is introduced, which explains how creative performance can result from two distinct types of cognitive processes evoked by approach and avoidance motivation. Then, the conservation of energy principle predicting when and how approach and avoidance motivation enhance performance is introduced. The introduction ends with a brief overview of the subsequent chapters in this dissertation.

Defining Approach and Avoidance Motivation

Goals that people strive for guide behavior towards positive outcomes (approach motivation) or away from negative outcomes (avoidance motivation). This distinction of approach and avoidance motivation is fundamental and basic. As put by Elliot (2008, p5): “Both approach and avoidance motivation are integral to successful adaptation; avoidance motivation facilitates surviving, while approach motivation facilitates thriving”. Approach and avoidance goals automatically evoke strategies related to approaching or avoiding (un)desired outcomes.

People differ in the extent to which they are sensitive for cues signaling potential positive outcomes or negative outcomes (for a reviews see Carver, Sutton, & Scheier, 2000; Larsen & Augustine, 2008), and in the extent to which they tend to strive for approach or avoidance goals (i.e., approach and avoidance temperament, Elliot & Thrash, 2002; 2010). For example, people high in extraversion are more sensitive to positive feedback, whereas people high in neuroticism are more sensitive for negative feedback (Larsen & Ketelaar, 1989; Smillie, Cooper, Wilt, & Revelle, 2012), and some people are stimulated to perform better by promising monetary rewards, whereas others are more sensitive to threatening with monetary punishments (Savine, Beck, Edwards, Chiew, & Braver, 2010). Along similar lines, when people are asked to list the goals that they are currently striving for, some people are more likely to report striving for approach goals, such as “make my parents proud of me”, or “learn new things”, whereas others are more likely to report striving for avoidance goals, such as “avoid looking inferior to others”, or “not get behind in my work” (Elliot & Sheldon, 1997).

Individual differences thus predict approach and avoidance goal striving, but the onset of approach and avoidance goals can also be the result of characteristics of specific situations. For example, seeing things that one would want to approach, such as cute puppies or tasty cookies, can evoke approach motivation (Gable & Harmon-Jones, 2008). Also instructing people explicitly to strive for approach goals (e.g., to improve
Motivated Creativity

performance, or to do better than others), or avoidance goals (e.g., to not deteriorate in performance, or to not do worse than others) can evoke the different motivational orientations (Van Yperen, 2003; Van Yperen, Hamstra, & van der Klauw, 2011). Even very subtle cues, such as seeing the color red which is associated with danger, can evoke avoidance motivation (Elliot, Maier, Binser, Friedman, & Pekrun, 2009; Mehta & Zhu, 2009). Approach and avoidance motivation thus can be the result of both stable individual differences (trait), and of fluctuating situational influences (state), and provide direction to behavior toward positive, or away from negative outcomes.

Sometimes actual approaching or avoiding behavior is needed to achieve these goals (move closer to the fireplace to get warm, or stay away from a bakery to avoid yielding to unhealthy temptations). At other times more indirect measures are needed that do not encompass physically moving toward or away from something (study hard to get a good grade for an exam, or closely monitor the time to avoid being late). Sometimes achieving approach goals may even involve avoiding behavior, or avoidance goals approaching behavior (stop smoking to improve one's condition, go to the gym to avoid gaining weight). Approach and avoidance thus can be distinguished on both the level of outcomes or end-states (system level), and on the level of means or processes of moving towards desired outcomes or away from negative outcomes (strategic level, Scholer & Higgins, 2008). In this dissertation approach and avoidance are conceptualized as desired, or undesired, end-states or outcomes. In the General Discussion I will return to these different levels of approach and avoidance within the theory of regulatory focus (Higgins, 1997).

**Functions of Approach and Avoidance Motivation**

The distinct functions of approach and avoidance motivation, guiding behavior toward positive outcomes and away from negative outcomes, presumably have such a fundamental role in survival that many species developed a lateralized brain in which one hemisphere specializes in avoidance related matters and the other in approach related matters. An advantage of such lateralization of the brain is that it enhances cognitive capacity because specializing one hemisphere for a particular function leaves the other hemisphere free to perform other functions (Levy, 1977). This specialization of different brain hemispheres for approach and avoidance has been observed in many different species, such as birds, fish, toads, lizards, monkeys, and humans (for extensive reviews see Vallortigara, 2000; Vallortigara & Rogers, 2005).
Another advantage of specializing different hemispheres in approach and avoidance related functions, besides heightened brain efficiency, is that it allows for enhanced group coordination when group members share the same directionality of this lateralization. For example, among humans, approach motivation is mostly associated with activation in the left hemisphere (Davidson, Ekman, Saron, Senulis, & Friesen, 1990; Harmon-Jones, 2003; Harmon-Jones & Allen, 1998). Because the left hemisphere controls the right side of the body, this left hemispheric activation enhances attention to the right visual field and readiness to move towards the right (Harmon-Jones, 2003; Nash, McGregor, & Inzlicht, 2010; Vallortigara & Rogers, 2005). Indeed, approach motivated humans show a right-oriented bias. For example, when humans kiss their romantic partners, they tend to turn their heads to the right (Güntürkün, 2003), when attempting to save a penalty during soccer games, approach motivated goalkeepers tend to dive towards the right (Roskes, Sligte, Shalvi, & De Dreu, 2011), and when quickly dividing lines into two equal parts, approach motivated humans show a rightward bias (Friedman & Förster, 2005a; Nash et al., 2010; Roskes et al., 2011). Sharing the same directional bias within groups under approach (or avoidance) motivation, allows for enhanced coordinated action, which increases a group's likelihood of survival (Ghirlanda & Vallortigara, 2004; Vallortigara & Rogers, 2005).

Examples of such coordinated behavior can be observed among African hunting dogs, which move together and hunt in coordinated groups to overpower large prey (Courchamp, Rasmussen, & Macdonald, 2002). An avoidance-related example of such coordinated behavior can be observed among butterflies trying to escape from predators. Also they benefit from moving as a group, because larger group-size decreases the likelihood that a certain individual is caught (Burger & Gochfeld, 2001). The evolutionary embedded tendency to move in a synchronized way reduces effort required for coordinating actions and increases the likelihood of success. Because of the survival-advantage of efficient coordination, the directionality of lateralization in the brain and the accompanying behavioral tendencies became evolutionary stable (Ghirlanda & Vallortigara, 2004).

An example of such biased directional tendency among humans that could potentially be exploited, has been observed among goalkeepers during penalty shootouts in the FIFA World Cup of soccer (Roskes et al., 2011). Penalty shoot-outs are used to decide knockout-stage matches ending in a tie. Five players from each team alternate in shooting penalties from an 11 meter distance toward the goal defended by the other team's goalkeeper. Successful defense of the goal has heroic connotations, and is a
relatively rare event in World Cup penalty shoot-outs (only 20% of the shots is saved). As German goalkeeper Oliver Kahn put it “Kickers are the ones that can lose in a penalty shoot-out; goalkeepers are the ones that can win and ultimately become the heroes” (quoted in “Goalkeepers Give Shoot-Out Tips”, 2010). This approach motivation among goalkeepers is especially strong when their team is behind, making their role crucial in regaining the possibility to win the game (this situation occurs on 12% of all penalties in the history of the World Cup). Indeed, when their team is behind, goalkeepers were twice more likely to dive to the right than to the left. When their team was ahead or when the score was tied, no such bias was observed, see Figure 1.1 (Roskes et al., 2011).

![Figure 1.1](image)

**Figure 1.1.** Percentage of goalkeepers’ dives and penalty takers’ shots that were to the left, middle, and right as a function of whether the goalkeeper's team was behind, tied with, or ahead of the penalty taker's team (from Roskes et al., 2011).

Clearly there are great advantages in shared directionality of the lateralization of approach and avoidance tendencies, as it assists in group coordination. However, there is a drawback: group level behavioral tendencies make behavior predictable (Vallortigara & Rogers, 2005). For example, some types of toads are more responsive to predators appearing on their left side (Vallortigara, Rogers, Bisazza, Lippolis, & Robins, 1998). Predators could potentially exploit this left-oriented bias and approach their prey from the right side. Although this has not yet been extensively studied (see Vallortigara & Rogers, 2005), there is evidence from the scale-eater fish of Lake Tanganika of such exploitation. These fish eat the scales of other fish, and to do so they exhibit asymmetry of the mouth favoring the side with higher chance of success (Hori, 1993). Similarly, in penalty shoot-outs during soccer games, knowledge of the right-
oriented bias among goalkeepers whose teams are behind could be exploited by penalty takers, although there is no evidence to date that this occurs.

The behavioral biases described above, arguably occur automatically and outside of conscious awareness. Does this mean that that nothing can be done to avoid exploitation? Research on overcoming automatic biases provides a ray of hope. People can calibrate their responses, however, incorporating situational cues and overriding automatic reactions requires time and cognitive resources (Bargh & Ferguson, 2000; Schneider & Chein, 2003). When people are acting under a high time pressure, and thus have little time to adjust their behavior, they are more likely to act on their initial automatic impulses (Gray, 2001; Tomarken & Keener, 1998). However, when sufficient time is available, people are able to overcome automatic tendencies. For example, given sufficient time, people can override the automatic tendency to think in stereotypical ways (Sassenberg & Moskowitz, 2005; Stewart & Payne, 2008), or the automatic tendency to lie if this serves self-interest (Shalvi, Eldar, & Bereby-Meyer, 2012). Similarly, the automatic right-oriented bias under approach motivation can be overruled by taking sufficient time.

When asked to quickly divide lines into two equal parts, approach motivated people show a small bias towards the right (i.e., draw the center line more towards the right than avoidance motivated people or people in neutral control conditions; Friedman & Förster, 2005a; Nash et al., 2010; Roskes et al., 2011). This line-bisection task is typically presented as a paper-and-pencil task in which, after bisecting each line, participants can directly move on to the next line, finishing the task rather quickly. Roskes et al. (2011) used a computerized version of the line-bisection task in which the time frame for dividing each line could be manipulated. Participants were given either 4000 ms for dividing each line (low time pressure condition) or 1500 ms (high time pressure condition). In the high time pressure condition, approach motivated participants showed a right-oriented bias. However, when they had 4000 ms they were able to override this automatic tendency and did not show a right-oriented bias. Thus, approach motivated people show the right-oriented bias, which potentially can be exploited, only when they have to act under a high time pressure.

Approach and avoidance motivation fulfill important roles in guiding behavior towards potential success and positive outcomes and away from potential harm and negative outcomes. As evidenced in directional biases, approach and avoidance motivation can influence performance. This influence, however, is not limited to direct effects on physical performance. The different functions of approach and avoidance
motivation often require different strategies. Whereas eager and explorative strategies may be more useful when striving for positive outcomes, vigilant and careful strategies may be more useful when striving to avoid negative outcomes. For this reason, it may not be surprising that approach and avoidance motivation have been found to distinctively influence a range of cognitive processes.

**Motivational Orientation and Cognitive Performance**

Because approach motivation is associated with safe environments, and the presence of potential positive outcomes, approach motivation evokes more explorative behavior and a broader focus compared to avoidance motivation. An extensive body of research has associated approach motivation with attentional flexibility (Friedman & Förster, 2005b), a relatively global focus ( Förster, Friedman, Özelsel, & Denzler, 2006; Förster & Higgins, 2005), explorative behavior and higher risk tolerance (Friedman & Förster, 2002; 2005a; 2005b), and abstract and higher order thinking (Kuschel, Förster, & Denzler, 2010; Semin, Higgins, de Montes, Estourget, & Valencia, 2005). This flexible style of processing information can enhance performance on tasks that require insight and creativity, and indeed approach motivation has often been associated with higher levels of creativity (Cretenet & Dru, 2009; Lichtenfeld, Elliot, Maier, & Pekrun, 2012; Friedman & Förster, 2000; 2001; 2002; Mehta & Zhu, 2009). For example, in one study Friedman & Förster (2005a) asked people to complete a paper-and-pencil maze. A mouse was depicted in the center of the maze, trying to find its way out. In one condition there was a tasty piece of cheese at the end of the maze (something the mouse would want to approach), and in the other condition there was a dangerous owl hovering over the maze (something the mouse would want to avoid). After finishing the maze, the participants of this study were asked to list as many creative uses for a brick as they could think of within a 1 minute limit. People in the approach condition, who had led the mouse to the piece of cheese, generated more creative ideas of how to use a brick than people in the avoidance condition, who had helped the mouse to escape the owl.

Avoidance motivation, on the other hand, is associated with potentially threatening environments and, compared to approach motivation, evokes more focused and vigilant behavior. Indeed, avoidance motivation has been associated with a more risk-averse, persevering processing style (Friedman & Elliot, 2008; Friedman & Förster, 2002), a relatively local focus and narrow attention scope (Derryberry & Reed, 1998; Maier, Elliot, & Lichtenfeld, 2008; Mehta & Zhu, 2009; Mikulincer, Kedem, & Paz, 1990), vigilant reasoning (Elliot, 2006; Friedman & Förster, 2005b), recruitment of cognitive
control (Koch, Holland, Hengstler, & van Knippenberg, 2009; Koch, Holland, & van Knippenberg, 2008; Miron-Spektor, Efrat-Treister, Rafaeli, & Schwarz-Cohen, 2011), and persistence on problem solving (Friedman & Elliot, 2008). This systematic and persistent style of processing information can enhance performance on tasks that require vigilance, cognitive control, and attention to detail (Friedman & Förster, 2000; 2005a; Koch et al., 2008; 2009). For example, Koch and colleagues (2008) asked people to either flex their arm, a movement associated with approach and bringing things closer to oneself, or to extend their arm, a movement associated with avoidance and pushing things away. People in the avoidance condition performed better on the (cognitively taxing) Stroop task, in which they had to indicate the color in which color-words were presented while ignoring the content of the words. Summarizing, approach motivation evokes cognitive flexibility which stimulates creativity, and avoidance motivation evokes cognitive persistence which may enhance performance on detail-oriented tasks but undermines creativity.

Motivational Orientation and Creativity

Throughout this dissertation we conceptualize creativity not as a process (i.e., creative versus noncreative thinking) but as outputs that can be evaluated on creativity (see Goldenberg, Mazursky, & Solomon, 1999). The level of creativity of outputs (e.g., ideas or paintings) depends on the extent to which these products are both original and appropriate (the commonly accepted definition of creativity, see Amabile, 1983; Guilford, 1967; Hennessey & Amabile, 2010; Sternberg & Lubart, 1999). Avoidance motivation has often been associated with the production of less creative products and ideas than approach motivation. However, does avoidance motivation always undermine creativity? Does cognitive persistence render high levels of creative performance impossible?

Indeed, creativity is primarily associated with flexible rather than systematic thinking (Ansburg & Hill, 2003; Förster, Epstude, & Özelsel, 2009; Förster, Friedman, & Liberman, 2004; Razoumnikova, 2000), and many researchers have proposed that to be creative people have to think flexibly and associatively (e.g., Duncker, 1945; Eysenck, 1993; Simonton, 1997; Smith & Blankenship, 1991; Smith, Ward, & Schumacher, 1993). However, a growing body of literature shows that creative outcomes can be the result of two distinct cognitive processes - people are able to come up with ideas that are equally creative by objective standards by (1) engaging in flexible thinking and exploring many different cognitive categories and approaches (e.g., Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Winkielman, Schwarz, Fazendeiro, & Reber,
Motivated Creativity

2003), as well as (2) systematic thinking and exploring a few cognitive categories or approaches systematically and in-depth (e.g., De Dreu, Baas, & Nijstad, 2008; Dietrich & Kanso, 2010; Goldenberg & Mazursky, 2000; 2002; Roskes, De Dreu, & Nijstad, 2012a; Sagiv, Arieli, Goldenberg, & Goldschmidt, 2010). To deal with these seemingly conflicting findings, De Dreu and colleagues (2008) developed the Dual Pathway to Creativity Model, describing two alternative pathways to creative performance.

**Dual pathway to creativity model**

The Dual Pathway to Creativity Model (Baas, De Dreu, & Nijstad, 2008; De Dreu et al., 2008; Nijstad, De Dreu, Rietzschel, & Baas, 2010; Rietzschel, De Dreu, & Nijstad, 2007) describes two ways of achieving creative outputs: Cognitive flexibility and cognitive persistence. Cognitive flexibility enables accessibility to multiple and broad cognitive categories, flexible switching between these categories, and a global processing style (i.e., a focus on the big picture rather than the details; Förster et al., 2009). A vast body of research has shown that creative performance can be achieved through a flexible, fluent, and divergent way of thinking (e.g., Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Winkielman et al., 2003). Cognitive persistence, on the other hand, enables focused and systematic effort, in-depth exploration of a relatively small number of cognitive categories, and a local processing style (De Dreu et al., 2008; De Dreu, Nijstad, Baas, Wolsink, & Roskes, 2012). Creative performance can also be achieved through such a persistent and systematic way of thinking, and exploring only a limited number of perspectives in-depth (Dietrich, 2004; Dietrich & Kanso, 2010; Finke, 1996; Rietzschel, Nijstad, & Stroebe, 2007; Sagiv et al., 2010; Simonton, 1997).

According to the Dual Pathway to Creativity Model, certain traits, states, and situational cues, can evoke either a flexible or a persistent processing style, and high levels of creative performance can be achieved through both flexibility and persistence. Initial support for this idea is based on the finding that both positively and negatively valenced moods can evoke creativity. A prerequisite for moods, whether positive or negative, to lead to creative performance is that the mood is activating rather than deactivating. Happiness and fear, for example, activate more than relaxation and sadness, and thus evoke higher levels of creativity (Baas et al., 2008; De Dreu et al., 2008). However, happiness (like approach motivation) evokes cognitive flexibility, associative thinking, and a global processing style, and leads to creativity through the flexibility pathway. Fear (like avoidance motivation), on the other hand, evokes cognitive persistence, systematic thinking, and a local processing style, and leads to creativity through the persistence pathway (Baas et al., 2008; Hirt, Devers, & McCrea, 2008).
Thus, according to the Dual Pathway to Creativity Model, creative performance can be the result of flexible processing, but also of persistent processing. These different cognitive processing styles can be evoked by a variety of factors (such as mood). Following this line of reasoning, both approach motivation (evoking cognitive flexibility) and avoidance motivation (evoking cognitive persistence) could potentially lead to creative outputs. The prediction that approach motivation facilitates creativity because it evokes global and flexible processing, has recently received support. In four studies, De Dreu, Nijstad, and Baas (2011) found that people with higher levels of behavioral activation (as measured with the Behavioral Inhibition System / Behavioral Activation System scales, Carver & White, 1994) were more creative when flexible and global thinking was possible then when flexible thinking was less likely or impossible. Furthermore, people with higher levels of behavioral activation demonstrated more cognitive flexibility than people lower in behavioral activation – i.e., when asked to brainstorm about improving education in the Psychology department, they generated ideas in more different categories (such as ‘ideas having to do with student facilities such as extracurricular activities, library access, classroom interiors’, for more information see De Dreu et al., 2008).

**Avoidance motivation and creativity**

The set of studies by De Dreu and colleagues (2011) described above, supports the idea that approach motivation leads to creativity through cognitive flexibility. The idea that avoidance motivation can lead to creativity through cognitive persistence, however, seems to be at odds with the vast body of research showing detrimental effects of avoidance motivation on creativity and insight performance. Yet, recent work reveals that people striving to prevent negative outcomes can achieve the same levels of creativity as people striving for positive outcomes, as long as their goals are unfulfilled (Baas, De Dreu, & Nijstad, 2011a). Baas and colleagues asked participants to complete the task developed by Friedman and Förster (2005a) in which they had to lead a mouse out of a maze towards a piece of cheese, or away from an owl. Participants either successfully completed the maze, or were interrupted during the task by a ‘technical error’. Interestingly, the participants who were trying to lead the mouse away from the owl (prevention-focus) solved more creative insight problems and generated more original ideas when they had not completed the maze task, and thus had not yet completed their avoidance-goal, than when they had completed the maze task. Moreover, their level of creativity did not differ from participants trying to lead the mouse towards the piece of cheese (promotion-focus).
The work by Baas and colleagues (2011a) demonstrates that people striving to avoid negative outcomes can be exactly as creative as people striving for positive outcomes. However, it does not provide information about the cognitive processes leading to creative performance among avoidance motivated individuals. One the one hand, it is possible that active or unfulfilled avoidance goals evoke more flexibility, and thus change the persistent and systematic processing style of avoidance motivated individuals in a more flexible and divergent processing style. On the other hand, it is possible that active or unfulfilled avoidance goals do not change the ‘default’ persistent processing style of avoidance motivated individuals, but stimulate them to compensate for their inefficient (for creativity) processing style by investing more cognitive resources. The latter prediction seems most viable, because we know that avoidance motivation evokes a persistent and systematic processing style (Friedman & Elliot, 2008; Friedman & Förster, 2002, 2005a, 2005b; Koch et al., 2008; 2009), and we know that persistent and systematic thinking can result in creative output just like flexible and associative thinking (Baas et al., 2008; Dietrich, 2004; Dietrich & Kanso, 2010; De Dreu et al., 2008; Finke, 1996; Rietzschel, De Dreu, & Nijstad, 2007; Sagiv et al., 2010). Moreover, if avoidance motivated people achieve creative performance through persistent processing, this may explain why avoidance motivation is usually associated with reduced creativity, and what the circumstances are under which avoidance motivation leads to high levels of creativity.

**The Present Dissertation: Conservation of Energy**

In this dissertation I propose a *Conservation of Energy Principle* to explain when and how approach and avoidance motivation stimulate or impede performance, and what are the consequences of approach and avoidance goal striving. As described earlier, approach motivation evokes cognitive flexibility, whereas avoidance motivation evokes cognitive persistence. The flexible and associative cognitive style evoked by approach motivation, 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). In contrast to cognitive flexibility, the persistent cognitive style evoked by avoidance motivation is associated with high effort, perseverence and a slower speed of operation (De Dreu et al., 2008; Evans, 2003; Winkielman et al., 2003). Because it relies more on executive control, it is more constrained by working memory capacity (De Dreu et al., 2012; Evans, 2003; Süß, Oberauer, Wittmann, & Schulze, 2002).
Introduction

The relatively persistent, systematic, and controlled information processing that is evoked by avoidance motivation requires executive control, and taxes working memory capacity, cognitive resources, and energy – in other words: it is costly (Bohner, Moskowitz, & Chaiken, 1995; Chaiken & Trope, 1999; Evans, 2003; Koch et al., 2008; Winkielman et al., 2003). In general, people (as well as non-human organisms) are reluctant to spend energy unless the benefits of expending this energy outweigh the costs (Tooby & Cosmides, 1990). From this conservation of energy perspective, it follows that people would be reluctant to engage in this kind of effortful cognitive processing evoked by avoidance motivation. In Chapter 2 the implications of this conservation of energy principle are discussed in detail, and directions for future research are presented to test predictions with regard to performance under approach and avoidance motivation that follow from this perspective.

In this dissertation it is proposed that performance under avoidance motivation is particularly demanding compared with performance under approach motivation. This should especially be the case for tasks that require creativity and insight, because creative and insight performance is more difficult with a persistent processing style. In Chapter 3 the effects of approach and avoidance motivation on creativity and insight performance are examined in five experiments. This chapter provides a direct test of the idea that approach motivation evokes a flexible and associative way of thinking, whereas avoidance motivation evokes a systematic and persistent way of thinking, but that both can lead to creativity. Furthermore, the circumstances under which avoidance motivation results in equal levels of creative performance as approach motivation are examined, and the consequences of creative performance in terms of cognitive depletion.

Chapter 4 studies another implication of the conservation of energy principle. Because performance under avoidance motivation relies more heavily on the recruitment of cognitive control and resources, stressors or other distracters should undermine performance under avoidance motivation more than performance under approach motivation. In Chapter 4 the consequences of working under time pressure are studied, to test the prediction that working under a high time pressure undermines performance more under avoidance rather than approach motivation. Chapter 5 discusses the consequences of thinking in a flexible and associative way versus in a systematic and persistent way from a different perspective. This chapter addresses how products that result from the two different processes are evaluated differently. Finally, Chapter 6 discusses implications of the findings presented in this dissertation, and suggests directions for future research.
Overview of the Chapters

Chapter 2: Avoidance motivation and conservation of energy.

Chapter two puts forward a conservation of energy account to explain how and when approach and avoidance motivation facilitate performance, and what are the consequences of striving for approach and avoidance goals. We review relevant literature and propose directions for future research. Compared to approach motivation, avoidance motivation evokes vigilance, attention to detail, systematic information processing, and recruitment of cognitive resources. From a conservation of energy perspective it follows that people would be reluctant to engage in the kind of effortful cognitive processing evoked by avoidance motivation, unless the benefits of expending this energy outweigh the costs. We put forward three empirically testable propositions concerning approach and avoidance motivation, investment of energy, and the consequences of such investments. Specifically, we propose that compared to approach-motivated people, avoidance-motivated people (1) carefully select situations in which they exert such cognitive effort, (2) are only be able to perform well in the absence of distracters that occupy cognitive resources, and (3) become depleted after exerting such cognitive effort.

Chapter 3: Necessity is the mother of invention: Avoidance motivation stimulates creativity through cognitive effort

Chapter three systematically examines the effects of approach and avoidance motivation on creative performance, and the consequences of such performance on depletion. In accordance to the Dual Pathway to Creativity Model, this chapter tests the idea that approach motivation evokes a flexible processing style, and avoidance motivation a persistent processing style, and that both can result in equal levels of creative performance. Following the theoretical framework presented in Chapter two, we hypothesized that avoidance-motivated individuals are not unable to be creative, but they have to compensate for their inflexible processing style by effortful and controlled processing. Results of 5 experiments revealed that when individuals are avoidance motivated, they can be as creative as when they are approach motivated, but only when creativity is functional for goal achievement, motivating them to exert the extra effort (Experiments 1–4). We found that approach motivation was associated with cognitive flexibility and avoidance motivation with cognitive persistence (Experiment 1), that creative tasks are perceived to be more difficult by avoidance-than by approach-motivated individuals, and that avoidance-motivated individuals felt more depleted after creative performance (Experiment 2a, 2b, and 3). Finally, creative
performance of avoidance-motivated individuals suffered more from a load on working memory (Study 4). The results suggest that for people focusing on avoiding negative outcomes, creative performance is difficult and depleting, and they only pay these high cognitive costs when creativity helps achieving their goals.

**Chapter 4: Avoidance motivation and choking under time pressure**

Chapter four focuses on how working under a high time pressure influences the performance of approach and avoidance motivated individuals. Results of five experiments reveal that performance on a variety of cognitive tasks under avoidance motivation is fragile and can be easily undermined. Performance under avoidance motivation relies more heavily on cognitive control and the availability of cognitive resources than approach motivation. When working under a high time pressure, avoidance motivated individuals become overloaded and their performance level drops. The performance of approach motivated individuals in contrast, is relatively mildly impeded by working under a high time pressure.

**Chapter 5: Understanding creative processes affects creativity judgments**

Whereas Chapter 2-4 focus on factors influencing creative performance, Chapter 5 focuses on how this creative performance in evaluated by others. The previous chapters describe and demonstrate how creativity can be the result of two different processes: Cognitive flexibility and cognitive persistence. In this chapter we examine how the evaluation of creative products is influenced by knowledge of the process through which it came about. Creativity judgments play an important role in determining which movies are awarded, which restaurants receive Michelin stars, and which business start-ups and research proposals are funded. Building on the hindsight bias literature, we propose that ideas which are generated through a flexible way of thinking or sudden insights are surprising and seem to come ‘out of the blue’. When the exact same ideas are generated through a persistent and systematic way of thinking, it is easier to follow the reasoning and understand how someone came up with the ideas. In turn, this may make the idea seem more obvious and unsurprising, and therefore less creative. In three experiments we find support for this “knew-it-all-along” effect in creativity judgments: The exact same products were consistently judged as less creative when they were generated through a systematic rather than flexible process.
Chapter Two

Avoidance Motivation and Conservation of Energy

Promising opportunities can motivate people to achieve positive outcomes and looming failures can motivate people to avoid negative outcomes. How do these different types of motivation influence goal pursuit? In which situations is approach motivation more beneficial and in which situations is avoidance motivation more beneficial? How does motivation influence performance on different types of tasks? What are consequences of striving for approach and avoidance goals? Is striving for certain goals more depleting than others? In the following, we frame our discussion of these questions around the principle that people are reluctant to expend cognitive resources unless the benefits outweigh the costs. We put forward three propositions regarding when approach and avoidance motivation facilitate performance, and the consequences of striving for approach and avoidance goals.

We define approach motivation as the energization of behavior by or the direction of behavior toward positive stimuli (objects, events, possibilities), and avoidance motivation as the energization of behavior by or the direction of behavior away from negative stimuli (Elliot, 2006). People differ in the extent to which they are sensitive to cues signaling potential positive or negative outcomes (Carver et al., 2000; Elliot & Thrash, 2002; Larsen & Augustine, 2008), and in the extent to which they tend to strive for approach or avoidance goals (Elliot & Church, 1997). However, approach and avoidance motivation can also be triggered by situational cues. For example, observing things that one would want to approach, such as cute puppies or tasty cookies, evokes approach motivation (Gable & Harmon-Jones, 2008). Also, explicitly instructing people to strive for approach goals (e.g., to improve performance, to do better than others), or avoidance goals (e.g., to not decline in one’s performance, to not do worse than others) can evoke different motivational orientations (Van Yperen, 2003; Van Yperen, Hamstra, & van der Klauw, 2011). Even subtle cues, such as seeing the color red, which is associated with danger, can evoke avoidance motivation (Mehta & Zhu, 2009). Thus, approach and avoidance motivation can be a product of both stable individual differences (trait) and fluctuating situational influences (state).¹

Approach and avoidance motivation influence cognitive processes and behavior (e.g., Cretenet & Dru, 2009; Elliot, 2006; Friedman & Förster, 2005b; Roskes et al.,

¹ One theoretical framework that makes use of the approach-avoidance distinction, and that is often the target of queries regarding the use of this distinction, is regulatory focus theory. This theory distinguishes between approach and avoidance at different levels of analysis (Scholer & Higgins, 2008): A distinction is made between desired or undesired end-states (system level), the process of moving towards desired end-states or away from undesired end-states (strategic level), and the tactics used to serve approach and avoidance strategies (tactic level).
Avoidance Motivation and Conservation of Energy

Avoidance Motivation and Conservation of Energy

2011), in turn influencing how well people perform on different types of tasks. Approach motivation evokes a relatively flexible processing style, eagerness, a global focus, and enhances performance on tasks that require creativity and insight (Cretenet & Dru, 2009; De Dreu et al., 2011; Lichtenfeld et al., 2012; Friedman & Förster, 2002). For example, people typically generate more creative ideas (e.g., creative uses for a brick, Mehta & Zhu, 2009) when they are approach- rather than avoidance-motivated. Avoidance motivation in contrast, evokes systematic information processing, vigilance, a local focus, and enhances performance on tasks that require vigilant attention to detail (Förster et al., 2004; Friedman & Förster, 2005a; Koch et al., 2008). For example, when people are avoidance- rather than approach-motivated, they typically perform better on the Stroop task in which they have to indicate the color in which color-words are presented while ignoring the content of the words (e.g., Koch et al., 2008). It seems that both approach and avoidance motivation can be useful, but in different situations.

Conservation of Energy

In general, people (as well as non-human organisms) are reluctant to spend energy unless the benefits of expending this energy outweigh the costs (Tooby & Cosmides, 1990). As described above, compared to approach motivation, avoidance motivation evokes persistent, systematic, and controlled information processing. Such processing requires executive control, and taxes working memory capacity, cognitive resources, and energy (i.e., it is costly; Bohner et al., 1995; Chaiken & Trope, 1999; Evans, 2003; Koch et al., 2008). From a conservation of energy perspective it follows that people would be reluctant to engage in this kind of effortful cognitive processing evoked by avoidance motivation. In Roskes et al. (2012a) we propose a conservation of energy principle to explain when and how avoidance motivation enhances (creative) performance. Here we further develop this idea and put forward three empirically testable propositions concerning approach and avoidance motivation, investment of energy, and the consequences of such investments. Specifically, we propose that compared to approach-motivated people, avoidance-motivated people (1) carefully select situations in which they exert cognitive effort, (2) only perform well in the absence of distracters that occupy cognitive resources, and (3) become depleted after exerting cognitive effort.

Proposition 1: Selective Investment of Resources

Avoidance motivation leads to the recruitment of cognitive resources and a focusing of attention and energy. These resources, however, are limited, and people
should be reluctant to spend them. We posit that avoidance-motivated people selectively invest their effort and resources. We found evidence for this in a series of studies in which we asked people to do creativity tasks. Creativity tasks are particularly demanding for avoidance-motivated people, because creativity is stimulated by flexible and associative thinking which is inhibited under avoidance motivation. Although creativity can also be achieved through systematic and persistent thinking (De Dreu et al., 2008; Nijstad et al., 2010; Roskes et al., 2012a), creative performance through systematic efforts requires considerable energy. This implies that under avoidance motivation, people should be relatively reluctant to invest in creative performance, and should only be willing to invest their resources when it is worthwhile, e.g., when it helps them to avoid negative outcomes. In other words, we suggest that the investment of effort and resources depends on (a) the quantity of effort and resources that this investment requires, and (b) the likelihood that it will lead to successful avoidance. Additionally, avoidance motivated people may be reluctant to devote their attention and energy to avoidance-goal irrelevant actions, and risk not being able to attend sufficiently to more urgent goal-relevant actions.

We tested this idea by asking students to do creative tasks that either served or did not serve goal progress (Roskes et al., 2012a). In five experiments we manipulated approach versus avoidance motivation, either by framing instructions in terms of approach or avoidance, or by providing visual cues. For example, in one experiment participants could lose vs. gain time to work on another task in which they could earn money, by generating ideas in an individual brainstorming session. We manipulated the likelihood that one’s own performance (versus another person’s performance) would determine the time provided for the payment-task to be high or low. When it was unlikely that they could influence their time on the payment-task, avoidance-motivated people generated ideas that were less original than those generated by approach-motivated people. However, when it was likely that they could influence their time on the payment-task, approach- and avoidance-motivated people were equally original. It thus appears that avoidance-motivated people were reluctant to exert effort and invest energy necessary for creative performance, unless creativity served their (avoidance) goals.

The idea that avoidance motivation may lead to selective investment of resources is further supported by the relation between avoidance motivation and withdrawal tendencies. Avoidance motivation has often been linked to behavioral inhibition (as opposed to activation), and withdrawal (Adams Jr., Ambady, Macrae, &
Avoidance Motivation and Conservation of Energy

Kleck, 2006; Amodio, Master, Yee, & Taylor, 2008; Carver, 2006). Avoidance-related personality traits, for example, have been linked to withdrawal from active job search behavior, even when job-satisfaction is low (Zimmerman, Boswell, Shipp, Dunford, & Boudreau, 2012). Additionally, situational threats evoke behavioral inhibition and heightened attention (Gray, 1990). It appears that avoidance motivation evokes a cognitively demanding processing style, which makes people think through, and prepare, actions thoroughly in order to act in a focused and efficient manner against threats. Future research could test the idea that avoidance motivation leads to behavioral inhibition in order to save energy while deciding on the best strategy to avert negative outcomes. If this is true, avoidance motivation is not only related to a general tendency for behavioral inhibition, but this relation between avoidance motivation and behavioral inhibition should be less pronounced when additional motivators are present (e.g., when action is required to avoid negative outcomes).

**Proposition 2: Performance when Resources are Occupied**

If avoidance motivation leads to heightened recruitment of cognitive resources and control, people should be more easily cognitively overloaded when they are avoidance- rather than approach-motivated and faced with resource-consuming distracters. In other words, the occupation of cognitive resources should particularly undermine performance when people are avoidance-motivated. Indeed, when we asked participants to solve creative insight problems while memorizing 5-digit numbers (compared to 2-digit numbers) avoidance-motivated people were no longer able to be as creative as approach-motivated people, even when creativity served goal progress (Roskes et al., 2012a).

Working under other types of pressure should similarly tax cognitive resources and consequently inhibit performance, particularly when people are avoidance-motivated. Time pressure, for example, elicits stress and arousal, which consume resources needed for exercising control over competing responses (Bargh, 1992; Keinan, Friedland, Kahneman, & Roth, 1999). We have found that performance suffered more from working under high time-pressure when people were avoidance-motivated than when they were approach-motivated, on tasks that require creativity (solving insight problems by making unusual associations), tasks that require attention to detail (locating specific targets among similar looking distracters), and tasks that require analytic thinking (solving mathematical problems; (Roskes, Elliot, Nijstad, & De Dreu, 2012). These effects were obtained by looking at personality differences in approach and avoidance temperament (Elliot & Thrash, 2002), by manipulating approach and
avoidance motivation within participants (winning points for correct answers on some items versus losing points for incorrect answers on other items), and by manipulating approach and avoidance motivation between participants (writing a story about a mouse trying to obtain a piece of cheese versus trying to avoid being eaten by an owl).

Previous research has shown that avoidance motivation leads to the recruitment of cognitive resources and control, which in turn can improve certain types of performance (Förster et al., 2004; Friedman & Förster, 2005a; Koch et al., 2008). However, our new findings suggest that when these resources are occupied (due to dual-task demands or working under time pressure) avoidance-motivated people's performance is impaired. This undermining effect of limiting cognitive resources should extend to other resource-consuming factors. We would, for example, expect similar performance undermining effects when working under self-evaluation threat (Tesser, 2000), during emotion suppression (Gross & John, 2003), or when trying to ignore distracting sounds (Campbell, 2005). Furthermore, these undermining effects should be particularly pronounced for people higher in working memory capacity, as people lower in working memory capacity may have difficulty recruiting sufficient cognitive resources regardless of the presence or absence of distracters. This idea may thus help generate new predictions about performance under avoidance- (relative to approach-) motivation in various situations.

**Proposition 3: Depletion after Avoidance Goal Striving**

Vigilantly engaging in effortful, controlled, systematic cognitive processing should furthermore be depleting. Striving for avoidance goals consumes energy and consequently has long-term negative effects on self-regulatory resources (Oertig, Schüler, Schnelle, Brandstätter, Roskes, & Elliot, in press). A growing body of literature provides additional evidence for long-term negative consequences of adhering to avoidance goals. Avoidance goals predict reduced cognitive functioning (Elliot & Church, 1997; Elliot & McGregor, 1999), lower work engagement (De Lange, Van Yperen, Van der Heijden, & Bal, 2010), unhealthy eating behaviors (Sullivan & Rothman, 2008), depression (Sideridis, 2005), stress (Elliot, Thrash, & Murayama, 2011; Sideridis, 2008), and lower well-being (Elliot & Sheldon, 1997). Also, avoidance-related constructs, such as working under a prevention focus, have been associated with resource depletion and impaired performance over time (Ståhl, Van Laar, & Ellemers, 2012). In Roskes et al. (2012a), we provided further support for this proposition: People who received instructions framed in avoidance (compared to approach) terms (e.g., they could lose vs. gain time to work on another task in which they could earn money), reported more
depletion directly after creative performance (on a four item scale, e.g., “I felt depleted”). Moreover, for avoidance (but not approach) motivated people, higher levels of creativity were associated with higher levels of depletion, which indicates that their depletion was due to the effort invested in the creative performance. However, the link between avoidance motivation and depletion has only been tested directly in a very limited number of studies, and further consideration of the specific circumstances that may attenuate or amplify the effect is needed.

**Conclusion**

Avoidance motivation makes people careful and enhances performance on tasks requiring vigilance and attention to detail (Friedman & Förster, 2005a; Koch et al., 2008). The immediate recruitment of cognitive resources associated with avoidance goal striving can be useful, or even necessary, to deal with urgent problems requiring immediate attention and to avoid the harmful effects of failure (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; David, Green, Martin, & Suls, 1997; Elliot, 2006). This focused attention and recruitment of resources can initially enhance performance, enabling one to adequately deal with present or imminent threatening situations. However, we propose that this intensive use of cognitive resources under avoidance motivation: (1) makes people reluctant to spend their energy and careful in selecting situations in which they invest cognitive effort and energy, (2) leads to cognitive overload and declined performance when distracters occupy cognitive resources, and (3) is depleting over time.

Although each of these propositions has gained some support, much more work is needed to test them and identify situations in which people invest (versus do not invest) their energy, factors that lead to cognitive overload, and factors predicting depletion. For example, we predicted that avoidance-motivated people would be more likely to invest their resources when this would help them avoid negative outcomes. Although avoidance motivation has often been related to declines in creativity, avoidance-related mood states, such as fear and anxiety, can sometimes stimulate creative performance (Baas et al., 2008; Clapham, 2001). Recent work has shown that people focusing on avoiding failure are just as creative as people focusing on achieving success as long as their goals are unfulfilled (Baas et al., 2011a) and when creativity is useful for goal progress (Roskes et al., 2012a), fitting the idea that in order to avoid bad outcomes, people tend to go out of their way to do whatever it takes to avoid these bad outcomes. For example, people focusing on eliminating losses are usually risk averse. However, when taking risks is the only way of eliminating losses, they are more likely
to take risks (Scholer, Zou, Fujita, Stroessner, & Higgins, 2010). Thus, avoidance motivation has merits even in domains not typically associated with avoidance motivation and the systematic way of thinking it evokes. Avoidance motivation energizes people to avert urgent dangers or losses. However, adhering to avoidance goals can be costly: it can be depleting and reduce well-being and performance, both in the short and the long run.

As avoidance motivation can be useful in some situations, and approach motivation in others, an interesting issue to address in future research concerns switching between approach and avoidance motivation. One potential avenue for future research is to identify predictors of switching between approach and avoidance motivation. Another is to look at potential costs attached to switching between these motivations, and whether there are differences in switching from approach to avoidance and avoidance to approach (e.g., switching speed, resource consumption, difficulty). Understanding when and how people switch between approach- and avoidance-based striving can have both theoretical and practical implications, as understanding which motivational orientation is most effective in a given situation, and the ability to actively switch orientations, can potentially be used strategically.

Ample research exists on how approach and avoidance motivation evoke different cognitive processes. Approach motivation has repeatedly been shown to evoke relatively associative thinking, a global focus, cognitive flexibility, and eagerness, whereas avoidance motivation has been shown to evoke more systematic thinking, a local focus, cognitive persistence, and vigilance. This knowledge about the cognitive processes evoked by approach and avoidance motivation provides a solid basis for thinking about the implications and consequences of approach and avoidance motivation. We propose a conservation of energy principle to explain how and when avoidance-motivated people choose to invest effort and cognitive resources. Studying the circumstances under which people striving for different types of goals flourish and achieve high levels of performance seems a promising avenue for future research.
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, & Lodewijks, 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 $\kappa = .86$) 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, $F(1,73) = 5.77, p = .019, \eta^2 = .07$.
Table 3.1. Originality and flexibility (+SD) in Experiment 3.1

<table>
<thead>
<tr>
<th></th>
<th>High functionality</th>
<th></th>
<th>Low functionality</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td>Originality</td>
<td>.81 (.043)</td>
<td>.82 (.031)</td>
<td>.81 (.039)</td>
<td>.78 (.044)</td>
</tr>
<tr>
<td>Flexibility</td>
<td>8.50 (2.31)</td>
<td>7.86 (2.21)</td>
<td>8.52 (1.75)</td>
<td>7.06 (2.86)</td>
</tr>
<tr>
<td>Persistence</td>
<td>.19 (.213)</td>
<td>.29 (.238)</td>
<td>.20 (.236)</td>
<td>.33 (.237)</td>
</tr>
<tr>
<td>Fluency</td>
<td>29.22 (12.45)</td>
<td>27.64 (11.19)</td>
<td>26.14 (7.05)</td>
<td>21.82 (11.03)</td>
</tr>
</tbody>
</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 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.
Motivated Creativity

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 ($M = 4.23, SD = 1.80$), $F(1,67) = 19.71, p < .001, \eta^2 = .23^3$. 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 -.169 (Bboot = -.550, SEboot = .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 (Bboot = -.013, SEboot = .107; 95% CI = [-.245, .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, η² = .06, but controlling for fluency did not affect the interaction between motivational orientation and functionality on originality, F(1,67) = 4.20, p = .044, η² = .06. There were no effects of motivational orientation and functionality on task enjoyment.

**Table 3.2.**

| Originality, experienced feelings of depletion and task difficulty (+SD) in Experiment 3.2a |
| --- | --- | --- |
| Creativity is functional | Creativity is not functional |
| | Approach | Avoidance | Approach | Avoidance |
| Originality | .79 (.042) | .80 (.039) | .79 (.042) | .74 (.058) |
| Depletion | 2.04 (1.07) | 3.17 (.87) | 2.53 (1.13) | 2.53 (1.29) |
| Difficulty | 4.05 (1.78) | 5.94 (1.21) | 4.44 (1.76) | 5.78 (1.17) |
| Fluency | 41.53 (19.09) | 44.39 (26.63) | 46.50 (21.60) | 29.39 (16.64) |
| Enjoyment | 3.56 (2.13) | 4.87 (2.64) | 3.36 (2.50) | 3.12 (2.25) |
**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 ($B_{boot} = -.771, SE_{boot} = .227; 95\% CI = [-1.138, -.323]$). 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
Motivated Creativity

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. grijs (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., ontwaken – to wake up). The other avoidance-words were: verm.ijden 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 verliezen vs. verkiezen (to lose vs. to choose).

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 ($\Delta_{\text{originality}}$) 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 (Nboot = 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>No feedback</th>
<th></th>
<th>With feedback</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
<td>Approach</td>
</tr>
<tr>
<td>Originality during 1(^{st}) half</td>
<td>.75 (0.039)</td>
<td>.73 (0.046)</td>
<td>.74 (0.040)</td>
</tr>
<tr>
<td>Originality during 2(^{nd}) half</td>
<td>.86 (0.060)</td>
<td>.85 (0.061)</td>
<td>.85 (0.039)</td>
</tr>
<tr>
<td>Depletion</td>
<td>1.99 (.58)</td>
<td>3.42 (.96)</td>
<td>2.37 (1.15)</td>
</tr>
<tr>
<td>Difficulty</td>
<td>4.00 (2.02)</td>
<td>4.89 (1.41)</td>
<td>3.89 (2.36)</td>
</tr>
<tr>
<td>Fluency</td>
<td>49.68 (16.50)</td>
<td>40.35 (13.43)</td>
<td>48.96 (15.13)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>5.74 (.87)</td>
<td>5.50 (1.40)</td>
<td>5.70 (1.15)</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, $M_{\text{age}} = 21.1$, $SD = 3.6$) 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). 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) 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 \((M = 4.86, SD = 1.05)\), \(F(1,135) = 12.74, p < .001, \)
Importantly, these main effects were qualified by a three-way interaction between functionality, motivational orientation, and load, $F(1,135) = 3.80, p = .053, \eta^2 = .03$.

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>Low cognitive load</th>
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<tbody>
<tr>
<td></td>
<td>RAT is functional</td>
<td>RAT is not functional</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td># Solved RAT items</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.65 (1.06)</td>
<td>5.81 (0.83)</td>
<td>5.85 (1.14)</td>
<td>4.69 (0.79)</td>
<td></td>
</tr>
<tr>
<td># Correctly recalled numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.35 (1.27)</td>
<td>7.94 (1.44)</td>
<td>8.20 (1.61)</td>
<td>8.56 (1.36)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>High cognitive load</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RAT is functional</td>
<td>RAT is not functional</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approach</td>
<td>Avoidance</td>
<td>Approach</td>
<td>Avoidance</td>
</tr>
<tr>
<td># Solved RAT items</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.36 (1.56)</td>
<td>4.41 (0.94)</td>
<td>5.29 (1.27)</td>
<td>4.50 (1.02)</td>
<td></td>
</tr>
<tr>
<td># Correctly recalled numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.68 (2.34)</td>
<td>7.12 (2.06)</td>
<td>7.38 (2.16)</td>
<td>7.29 (1.86)</td>
<td></td>
</tr>
</tbody>
</table>
Motivated Creativity

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
Motivated Creativity

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.
Chapter Four

Time Pressure Undermines Performance more under Avoidance Motivation than Approach Motivation
Motivated Creativity

Striving to avoid failure (avoidance motivation), as opposed to striving for success (approach motivation), has been associated with a variety of detrimental consequences. Research indicates that avoidance motivation evokes anxiety and threat appraisals, and, in the long run, can lead to lower intrinsic motivation, reduced subjective wellbeing, and the depletion of self-regulatory resources (De Lange et al., 2010; Elliot & McGregor, 1999; Elliot & Sheldon, 1997; Oertig et al., in press; Van Dijk, Seger, & Heller, in press). The consequences of avoidance motivation on short term cognitive performance, however, are less straightforward. Compared to approach motivation, avoidance motivation prompts vigilance, and a more focused and systematic way of thinking. This impairs performance on tasks that require insight and creativity (Friedman & Förster, 2002; 2005; Sligte et al., 2011), but enhances performance on tasks that require careful attention to detail ( Förster et al., 2004; Koch et al., 2008).

The focused, highly controlled information processing that is evoked by avoidance motivation requires cognitive resources and taxes energy, whereas the more heuristic and flexible processing evoked by approach motivation relies less on top-down executive control (Bohner et al., 1995; Evans, 2003; Koch et al., 2008; Roskes et al., 2012a; Winkielman et al., 2003). Because performance under avoidance motivation relies so strongly on cognitive resources, we expect performance under avoidance motivation to be fragile and easily undermined by cognitive overload. In the current research, we examine the effects of working under time pressure on performance on different types of tasks, and posit that performance is particularly undermined by high time pressure when individuals are avoidance motivated.

Previous work indicates that high time pressure impairs performance on a variety of tasks, such as arithmetic tasks, the Stroop task, chess games, and speaking one’s second language (Ganushchak & Schiller, 2009; Keinan et al., 1999; van Harreveld, Wagenmakers, & van der Maas, 2006). Two primary reasons for the detrimental effects of time pressure on cognitive performance have been identified. First, the experience of time pressure elicits stress and arousal, which distracts individuals from the task at hand (Bargh, 1992; Keinan et al., 1999). Second, time pressure leads to a heightened need to monitor task progress and the amount of time remaining, which consumes mental resources needed for effective task performance (Karau & Kelly, 1992; Kelly, Jackson, & Hutson-Comeaux, 1997). On the other hand, however, time pressure can also lead people to work in a more focused manner (Chajut & Algom, 2003) and can be activating (Gardner, 1990; Gardner & Cummings, 1988), which may enhance enjoyment (Freedman & Edwards, 1988; Zivnuska, Kiewitz, Hochwater, Perrewé, & Zellars, 2002).
Avoidance Motivation, Performance, and Time Pressure

and improve performance (Baas et al., 2008; Gardner, 1990). Given this potential for negative as well as positive effects, some researchers have suggested that there may be an optimal level of time-related stress, and that there is an inverted U-shaped relation between time pressure and performance, with both very low levels and very high levels of pressure being detrimental for performance (Baer & Oldham, 2006; Byron, Khazanchi, & Nazarian, 2010; Zivnuska et al., 2002). Some research supports this premise. For example, participants in a lab study performed best on anagram tasks under moderate levels of time pressure (Freedman & Edwards, 1988), and employees who reported experiencing a moderate level of time pressure were rated as more creative by their supervisors than employees who experienced a low level of time pressure (Baer & Oldham, 2006).

Given that dealing with time pressure consumes mental resources, and because these resources are limited (Baumeister, Bratslavsky, Muraven, & Tice, 1998; Kehr, 2004; Koch et al., 2008; Muraven, Tice, & Baumeister, 1998; Vohs & Heatherton, 2000), the detrimental effects of time pressure should be especially pronounced for people who process information in a controlled, systematic way that relies heavily on top-down cognitive control. As individuals who are avoidance motivated rely more on effortful, top-down control than those who are approach motivated, it follows that the negative effects of time pressure are likely to be more pronounced for avoidance motivated individuals. Importantly, this interaction between motivational orientation (approach vs. avoidance) and time pressure should apply to a broad range of cognitive tasks. Although avoidance motivation sometimes enhances performance on tasks that are a good fit to systematic processing styles, such as those that require attention to detail (e.g., the Stroop task, proofreading tasks; Koch et al., 2008; Mehta & Zhu, 2009), these tasks still require cognitive resources, and these resources are less available for such individuals under high time pressure. This argument applies equally well to tasks in which the systematic processing style of avoidance motivated individuals is not a good fit to the task (e.g., creative tasks). Thus, the detrimental effects of time pressure on performance may be more pronounced among avoidance motivated individuals regardless of the type of task that is executed. To test this possibility, and the robustness of the effect, we investigated performance on tasks that fit and did not fit the vigilant, detail-oriented processing style that is activated by avoidance motivation.

In the five experiments herein, we test the hypothesis that the performance of avoidance motivated individuals is undermined more by time pressure than the performance of approach motivated individuals. In Experiment 4.1, we examine the consequences of individual differences in the tendency to focus on avoiding negative
Motivated Creativity

outcomes (i.e., avoidance temperament, Elliot & Thrash, 2010). In Experiments 4.2 and 4.3, we manipulate motivational orientation within-subjects by having participants engage in tasks where they can win and lose points, and in Experiments 4.4 and 4.5 we manipulate motivational orientation between-subjects by having participants complete variations on the mouse-in-maze task (Friedman & Förster, 2001) in which participants need to lead a mouse toward a piece of cheese (approach), or away from an owl (avoidance). We examine the role of stress-related emotions in Experiments 4.1, 4.4, and 4.5, and the availability of cognitive resources in Experiment 4.5. We investigate performance on tasks that require creative insight (Experiment 4.1, 4.2, and 4.5), analytical thinking (Experiment 4.3), and attention to detail (Experiment 4.4), to test the generalizability of the findings across task type.

Experiment 4.1

In Experiment 4.1, we tested whether performance is especially inhibited by working under high time pressure for people high in avoidance temperament. We tested this hypothesis on performance on the Remote Associates Test (RAT; Mednick, 1962). The RAT is a creative insight task that requires participants to identify associations among words that seem to be unrelated on first sight. Participants are provided with three words (e.g., car, swimming, cue), and have to generate a word that is associated with all of them (e.g., pool). This task has been used in a number of prior studies on creative insight (e.g., Ansburg & Hill, 2003; Friedman & Förster, 2000; Griskevicius et al., 2006; Sligte et al., 2011). The first, most accessible associate to each of the words is often not related to the other words, therefore the solver must think of more distantly related information to connect the words.

In general, approach motivation is associated with enhanced performance on insight tasks of this nature (Cretenet & Dru, 2009; Friedman & Förster, 2002; Mehta & Zhu, 2009), because the flexible cognitive style that is activated by approach motivation promotes the creation of unusual associations. Avoidance motivated individuals can perform as well as approach motivated individuals when their performance helps them achieve their avoidance-based aims and purposes, but this consumes energy and requires considerable cognitive resources (Roskes et al., 2012a). Working under time pressure also taxes cognitive resources (Bargh, 1992; Keinan et al., 1999), and we predict that high (compared to low) time pressure will have a stronger undermining effect on insight performance for individuals high in avoidance motivation. In this experiment, time pressure (low vs. high) was manipulated between-subjects and
individual differences in avoidance temperament were measured. We assessed whether stress-related emotions could account for any observed performance differences.

Method

Seventy-seven students at the University of Amsterdam (43 female, \(M_{\text{age}} = 20.65, SD = 4.17\)) were randomly assigned to the low time pressure or the high time pressure condition. They received €2 for their participation. Avoidance temperament was measured (Elliot & Thrash, 2010) by having participants rate, on a 1 (strongly disagree) to 7 (strongly agree) scale, how much they agreed with six statements (e.g., “When it looks like something bad could happen, I have a strong urge to escape”; Cronbach’s \(\alpha = .76, M = 5.34, SD = 0.74\)). Participants subsequently completed 30 RAT items (10 easy, 10 moderately difficult, and 10 difficult [presented in random order]; see Harkins, 2006; Isen, Daubman, & Nowicki, 1987) under low time pressure (18 seconds per item) or high time pressure (8 seconds per item). The time frames for the low and high time pressure conditions were based on the average time that participants took to solve RAT items in a study without time constraints (13 seconds; Roskes et al., 2012a, Experiment 4) and adding one standard deviation (low time pressure condition) or subtracting one standard deviation (high time pressure condition).

We expected to find effects mainly on the moderately difficult items, due to likely ceiling (almost all easy items are solved) and floor (almost no difficult items are solved) effects. The numbers of correct responses to the RAT items at each level of difficulty were the dependent variables. After the RAT, participants completed a short mood questionnaire to assess stress-related emotions (Förster, Higgins, & Werth, 2004). This questionnaire assessed cheerfulness (“happy” and “content”, \(M = 4.46, SD = 1.12, \alpha = .76\)), dejection (“discouraged” and “disappointed”, \(M = 3.03, SD = 1.57, \alpha = .79\)), quiescence (“calm” and “relaxed”, \(M = 4.91, SD = 1.15, \alpha = .68\)), and agitation (“tense” and “worried”, \(M = 4.05, SD = 1.11, \alpha = .60\)) on a 1 (not at all) to 7 (extremely) scale. We expected stronger dejection and agitation, and weaker cheerfulness and quiescence for participants higher in avoidance temperament working under high time pressure.

Results

RAT performance. On average, participants solved 7.18 (SD = 1.83) easy, 4.51 (SD = 1.78) moderately difficult, and 1.13 (SD = 1.07) difficult RAT items. A multiple regression analysis was conducted with avoidance temperament, time pressure, and their interaction as predictor variables. For the easy and difficult RAT items we found no significant effects. For the moderately difficult RAT items, stronger avoidance temperament, \(β = -.30, p = .005\), and working under high time pressure were related to
worse RAT performance, $\beta = -0.36$, $p = .001$. In addition, the interaction of avoidance temperament and time pressure predicted performance on the moderately difficult RAT items, $B = -0.53$, $p = .036$. We conducted a simple slopes analysis using the approach of Aiken and West (1991) and software developed by Schubert and Jacoby (http://www.johannjacoby.de/stattools/SiSSy1.12.3.html). For people low in avoidance temperament (i.e., 1 standard deviation below the mean), there was no effect of time pressure on RAT performance, $B = -0.25$, $p = .33$. However, for people high in avoidance temperament (i.e., 1 standard deviation above the mean), there was a negative effect of time pressure on RAT performance, $B = -1.036$, $p < .001$. In other words, the performance of people high in avoidance temperament was undermined more by working under high time pressure than the performance of people low in avoidance temperament (see Figure 4.1).

Figure 4.1. Correlations between avoidance temperament and the number of correctly solved RAT items in Experiment 4.1.

Stress-related emotions. We tested for effects of avoidance temperament, time pressure, and their interaction on cheerfulness, dejection, quiescence, and agitation using multiple regression analysis. There was only a main effect of time pressure on quiescence; participants in the high time pressure condition reported less quiescence ($M = 4.56$, $SD = 1.29$) than participants in the low time pressure condition ($M = 5.22$, $SD = .91$), $F(1,73) = 6.89$, $p = .011$, $\eta^2 = .09$. There was no main effect of avoidance temperament and no interaction effect on any of the emotion measures. Due to the lack of interaction effects, we have no indication that the decline in performance of people high in avoidance temperament under high time pressure was due to heightened
stress-related emotions (we will return to this issue in Experiments 4.4 and 4.5, and in the general discussion).

**Experiment 4.2**

The results of Experiment 4.1 supported our hypothesis that working under high time pressure is particularly problematic for avoidance motivated individuals. Experiment 4.2 was designed to further test this hypothesis by manipulating rather than measuring avoidance motivation. Given that we manipulated motivational orientation within-subjects, measures of mood would be difficult to implement; as such, we did not include them in this experiment. We did, however, include a manipulation check for experienced time pressure.

**Method**

Seventy-seven students at the University of Amsterdam (60 female, \(M_{age} = 21.00, SD = 2.82\)) received €2 for participation, and were randomly assigned to the low time pressure or the high time pressure condition. Participants completed 30 RAT items (10 easy, 10 moderately difficult, and 10 difficult, as in Experiment 4.1) under low time pressure (18 seconds per item) or high time pressure (8 seconds per item). For some of the randomly presented items, participants were able to win a point by providing a correct answer, while an incorrect answer did not affect their score (approach condition); for the other items, participants could lose a point by providing an incorrect answer, while a correct answer did not affect their score (avoidance condition). Before each item appeared on the computer screen, participants were informed that the item would be a “win” or a “lose” item by presenting a plus (+) or a minus (-) sign, respectively. Because win and lose items were presented randomly, not all participants had exactly the same number of each. Therefore, the percentages of correct responses to the win items and the lose items were used as dependent variables in the analyses. Finally, to check whether the manipulation induced the experience of time pressure, participants indicated, on a 1 (strongly disagree) to 7 (strongly agree) scale, whether they had too little time to do the task, whether they had enough time to do the task (reversed), and whether they experienced time pressure (Cronbach’s \(\alpha = .79\), \(M = 4.68, SD = 1.42\)).
Results

**Manipulation check.** A t-test confirmed that the time pressure manipulation was successful, as participants in the high time pressure condition experienced more pressure ($M = 5.04, SD = 0.57$) than participants in the low time pressure condition ($M = 4.53, SD = 0.60$), $t(75) = -3.79, p < .001$.

**RAT performance.** On average, participants solved 7.48 ($SD = 1.70$) easy, 4.70 ($SD = 2.08$) moderately difficult, and 1.31 ($SD = 1.12$) difficult RAT items. The data were analyzed using a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) repeated measures analysis of variance (ANOVA) with time pressure as the between-subjects factor and motivational orientation as the within-subjects factor. As in Experiment 4.1, there were no differences between conditions for the easy and difficult RAT items. Participants solved fewer moderately difficult RAT items under high time pressure ($M = 4.18, SD = 1.84$) than low time pressure ($M = 5.21, SD = 2.20$), $F(1,74) = 6.68, p = .012, \eta^2 = .08$; there was no main effect of motivational orientation, $F(1,74) = .36, p = .55$. As expected, the interaction between motivational orientation and time pressure predicted RAT performance, $F(1,74) = 4.04, p = .048, \eta^2 = .05$. A simple effects analysis revealed that performance on the lose items was worse under high time pressure, $F(1,74) = 12.12, p = .001$, but performance on the win items was not, $F(1,74) = .65, p = .42$ (see Figure 4.2).

![Figure 4.2](image-url). Percentage of correctly solved moderately difficult RAT items (+SE) in Experiment 4.2.
Experiments 4.1 and 4.2 showed that performance on a creative insight task was particularly impaired by time pressure for individuals avoiding negative outcomes rather than approaching positive outcomes. However, the type of task utilized in these experiments was not a good fit for people avoiding negative outcomes, as avoidance motivation evokes focused and systematic information processing, but the task was best suited to heuristic and flexible processing. It is possible that time pressure only has an inimical influence on performance for avoidance motivated individuals on tasks that do not fit their processing style. As such, in Experiments 4.3 and 4.4 we aimed to test whether this undermining effect extends to other tasks that are better suited to avoidance motivation. The existing literature is mixed as to whether avoidance motivation is a good fit to straightforward analytical tasks such as basic math problems (Elliot, Shell, Bouas Henry, & Maier, 1997; Friedman & Förster, 2005; Seibt & Förster, 2004), but is quite clear that it is a good fit to mundane tasks requiring careful attention to detail (Kuschel et al., 2010; Mehta & Zhu, 2009). In Experiment 4.3, we utilized a straightforward analytical task, and in Experiment 4.4 we utilized a task requiring careful attention to detail. In Experiment 4.3, we assessed performance on basic math problems. As in Experiment 4.2, we manipulated time pressure between-subjects and motivational orientation within-subjects.

Method

Seventy-eight students at the University of Amsterdam (60 female, \(M_{\text{age}} = 21.86, \ SD = 4.89\)) received €2 for participation, and were randomly assigned to the low time pressure or the high time pressure condition. Participants completed eight basic math problems (e.g., \(114 / 2 - 58 = -1\)) under low time pressure (18 seconds per item) or high time pressure (8 seconds per item). As in Experiment 4.2, some of the randomly presented items were “win” items (approach condition) and some were “lose” items (avoidance condition). The percentages of correct responses to the win items and the lose items were used as dependent variables in the analyses. Finally, participants completed the same time pressure manipulation check as in Experiment 4.2 (Cronbach’s \(\alpha = .79, M = 4.64, SD = 1.40\)).
Motivated Creativity

Results

Manipulation check. A t-test confirmed that the time pressure manipulation was successful, as participants in the high time pressure condition experienced more pressure ($M = 5.02, SD = 0.57$) than participants in the low time pressure condition ($M = 4.46, SD = 0.58$), $t(76) = -4.26, p < .001$.

Math performance. The data were analyzed using a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) repeated measures ANOVA with time pressure as the between-subjects factor and motivational orientation as the within-subjects factor. Overall, participants performed worse on the math task under high time pressure ($M = 74.74, SD = 23.66$) than under low time pressure ($M = 82.01, SD = 22.68$), $F(1,76) = 10.34, p = .002, \eta^2 = .12$; there was no main effect of motivational orientation, $F(1,76) = .02, p = .96$. Furthermore, the interaction of motivational orientation and time pressure predicted math performance, $F(1,76) = 5.03, p = .028, \eta^2 = .06$. A simple effects analysis revealed that performance on the lose items was worse under high time pressure, $F(1,76) = 14.58, p < .001, \eta^2 = .16$, but performance on the win items was not, $F(1,75) = 1.92, p = .17$ (see Figure 4.3).

Figure 4.3. Percentage correctly solved math items (+SE) in Experiment 4.3.
Experiments 4.1, 4.2, and 4.3 provided converging evidence that performance under avoidance motivation is fragile and is impaired more by time pressure than performance under approach motivation. Experiments 4.1 and 4.2 revealed that high time pressure impaired performance under avoidance motivation on a creative insight task, and Experiment 4.3 revealed that high time pressure impaired performance on a basic analytical task. In Experiment 4.4, participants completed the d2 test, a task that requires careful attention to detail, which should be an ideal fit to avoidance motivation (Brickenkamp & Zillmer, 1998, also see Bates & Lemay, 2004). Both time pressure and motivational orientation were manipulated between-subjects allowing us to include the measures of stress-related emotions used previously in Experiment 4.1.

Method

Seventy-nine students at the University of Rochester (60 female, \(M_{\text{age}} = 19.75, \text{SD} = 1.40\)) were randomly assigned to the conditions of a 2 (time pressure: low vs. high) \(\times\) 2 (motivational orientation: approach vs. avoidance) between-subjects design. Participants were asked to look at a maze in which a cartoon mouse was depicted trying to find a piece of cheese at the end of the maze (approach condition) or trying to escape from an owl that was hovering over the maze (avoidance condition). They were asked to write a vivid story from the perspective of the mouse. In the approach condition, they were instructed to write about “the happiest day in the life of the mouse” by imagining the mouse getting closer to the cheese, finding it, and eventually eating it. In the avoidance condition, they were instructed to write about “the terrible death of the mouse” by imagining the mouse attempting to escape the owl and eventually being caught, killed, and eaten (Friedman & Förster, 2005).

After writing the story, participants proceeded to a computerized version of the d2 test. In the d2 test, the task is to cancel out all target characters (i.e., a “d” with a total of two dashes placed above and/or below it), which are interspersed with visually similar non-target characters (i.e., a “d” with more, or less, than two dashes, or a “p” with any number of dashes). A series of 48 characters appear in two horizontal rows on the screen, and participants cancel out targets by clicking on them. The test consisted of 14 successive series of characters, and participants had 20 seconds (low time pressure) or 13 seconds (high time pressure) to cancel out as many targets as possible. The total number of errors (i.e., both errors of omission and errors of commission) made by participants was used as the dependent variable. After the d2 test, participants
Motivated Creativity

completed the same mood questionnaire as in Experiment 4.1, assessing cheerfulness ($M = 3.20, SD = 1.24, \alpha = .57$), dejection ($M = 2.87, SD = 1.49, \alpha = .76$), quiescence ($M = 3.51, SD = 1.77, \alpha = .93$), and agitation ($M = 3.06, SD = 1.54, \alpha = .82$). Finally, participants completed the same time pressure manipulation check as in Experiments 4.2 and 4.3 (Cronbach’s $\alpha = .67, M = 5.69, SD = 1.24$). Participants received course credit for their participation.

Results

Manipulation check. Confirming that the time pressure manipulation was successful, a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) ANOVA predicting experienced time pressure, revealed that participants in the high time pressure condition experienced more time pressure ($M = 6.10, SD = 0.91$) than participants in the low time pressure condition ($M = 5.27, SD = 1.39$), $F(1,75) = 9.87$, $p = .002$, $\eta^2 = .12$. The experience of time pressure was not influenced by the manipulation of motivation orientation, $F(1,75) = .01$, $p = .91$, nor by the interaction between time pressure and motivational orientation, $F(1,75) = .41$, $p = .53$.

D2 performance. The data were analyzed using a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) between-subjects ANOVA. Overall, participants performed worse (i.e., made more errors) on the d2 test under high time pressure ($M = 235.43, SD = 22.18$) than under low time pressure ($M = 123.74, SD = 37.14$), $F(1,75) = 276.36$, $p < .001$, $\eta^2 = .79$; there was no main effect of motivational orientation, $F(1,75) = .22$, $p = .64$. Furthermore, the interaction of motivational orientation and time pressure predicted the number of d2 errors, $F(1,75) = 4.89$, $p = .030$, $\eta^2 = .06$. A simple effects analysis revealed that the d2 performance of participants in the approach condition was better in the low than in the high time pressure condition, $F(1,76) = 106.31$, $p < .001$, but this effect was even larger for participants in the avoidance condition, $F(1,76) = 177.23$, $p < .001$ (see Figure 4.4).

Stress-related emotions. A 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) between-subjects ANOVA predicting cheerfulness, dejection, quiescence, and agitation revealed no main effects of time pressure. There were main effects of motivational orientation: participants in the avoidance condition reported less cheerfulness$^4$ ($M = 2.83, SD = 1.10$ vs. $M = 3.55, SD = 1.28$), $F(1,75) = 6.95$, $p = .010$,

$^4$ Because of the low reliability of the cheerfulness scale, we also analyzed the data using the separate items (“I felt happy” and “I felt content”). This analysis showed that participants in the avoidance condition reported less happiness than participants in the approach condition ($M = 2.74, SD = 1.29$ vs. $M = 3.18, SD = 1.60$), $F(1,75) = 9.71$, $p = .003$, $\eta^2 = .12$, and no other main effects or interactions.
\( \eta^2 = .09 \), and less quiescence \((M = 2.95, SD = 1.49 \text{ vs. } M = 4.05, SD = 1.87)\), \( F(1, 75) = 8.26, p = .005, \eta^2 = .10 \) than participants in the approach condition. There were no main effects of motivational orientation on dejection and agitation, and no interaction effects on any of the mood measures. Thus, as in Experiment 4.1, we have no indication that the decline in performance of avoidance motivated individuals under high time pressure was due to heightened stress-related emotions.

![Figure 4.4. Number of errors on the d2 test (+SE) in Experiment 4.4.](image)

**Experiment 4.5**

Experiments 4.1-4.4 showed that performance under high time pressure is particularly undermined for avoidance motivated individuals. We found the same undermining effect for performance on tasks that rely on creative insight (Experiment 4.1 and 4.2) as for tasks that rely on basic analytical thinking (Experiment 4.3) and attention to detail (Experiment 4.4).

The undermining effect does not appear to be due to heightened stress-related emotions; in Experiment 4.5 therefore examined an alternative mechanism, namely the taxing of cognitive resources. The idea here is that if the undermining effect of working under high time pressure for avoidance motivated individuals is due to limited cognitive resources, we should find a smaller (or no) effect of high (vs. low) time
pressure among avoidance motivated individuals when cognitive resources are already occupied. It is only when sufficient cognitive resources are available that avoidance motivated individuals should perform worse under high relative to low time pressure; when working memory is already occupied, they should perform relatively poorly irrespective of time pressure.

The combined effects of time pressure and working memory load are harder to predict for approach motivated individuals. On the one hand, it is possible that these approach motivated individuals are not influenced by either time pressure or cognitive load, as they do not rely as much on working memory capacity and cognitive control. On the other hand, approach motivated individuals clearly rely on working memory to some extent; thus, it is possible that approach motivated individuals do not experience detrimental effects of time pressure alone (as in Experiments 4.1-4.4) or cognitive load alone (see Roskes et al., 2012a), but that their performance is only impaired when time pressure and cognitive load are both present.

We also examined an alternative explanation to the cognitive load account. It is possible that avoidance motivated people simply “give up” when they experience high time pressure. Therefore, we included a measure of motivation strength to test for this possibility. In Experiment 4.5, we manipulated motivational orientation and time pressure, and had participants work on the RAT under low or high cognitive load. After the RAT, we measured participants’ mood and strength of motivation.

Method

One-hundred and forty-two students at the University of Amsterdam (100 female, \( M_{age} = 21.06, SD = 3.56 \)) were randomly assigned to one of the 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) x 2 (cognitive load: low vs. high) between-subjects conditions. The study was presented as a multi-tasking assignment in which participants simultaneously completed language- and math-related tasks. As in Experiment 1, participants completed 10 easy, 10 moderately difficult, and 10 difficult RAT items under low time pressure (18 seconds per item) or high time pressure (8 seconds per item). During the task, a cartoon mouse appeared on the left side of the screen and an attractive piece of cheese (approach condition) or a dangerous owl (avoidance condition) appeared on the right side of the screen. 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). Cognitive load was induced by asking participants to memorize numbers while solving the RAT items. Before each RAT item, a two digit
number (low cognitive load) or a five digit number (high cognitive load) was displayed on the screen. Participants had to keep this number in mind while solving the RAT item, and then type this number after completing the RAT item (this procedure was based on Roskes et al., 2012a, Experiment 4). Before the actual task started, all participants completed five practice RAT items while remembering 1 digit numbers, in order to familiarize them with the task.

The number of correctly solved RAT items at each level of difficulty served as the dependent variables in the analyses. As in Experiments 4.1 and 4.2, we expected to find effects mainly on the moderately difficult RAT items. We also counted the number of correctly recalled numbers from the load manipulation. Participants completed the same mood questionnaire as in Experiments 4.1 and 4.4 assessing cheerfulness ($M = 4.77, SD = 1.00, \alpha = .70$), dejection ($M = 2.50, SD = 1.11, \alpha = .68$), quiescence ($M = 5.02, SD = 1.00, \alpha = .76$), and agitation ($M = 4.55, SD = .84, \alpha = .56$), and they completed the same time pressure manipulation check as in the previous experiments (Cronbach’s $\alpha = .86, M = 4.80, SD = 1.45$). Additionally, participants indicated, on a 1 (strongly disagree) to 7 (strongly agree) scale, whether they did their best on the RAT and whether they exerted effort to do the RAT, in order to assess motivation strength (Cronbach’s $\alpha = .83, M = 6.04, SD = .76$). Participants received course credit or €3.5 for their participation.

**Results**

*Mutation checks.* Confirming that the time pressure manipulation was successful, a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) x 2 (cognitive load: low vs. high) ANOVA predicting experienced time pressure, revealed that participants in the high time pressure condition experienced more time pressure ($M = 5.35, SD = 1.30$) than participants in the low time pressure condition ($M = 4.24, SD = 1.39$), $F(1,134) = 21.926, p < .001, \eta^2 = .14$. The experience of time pressure was not influenced by the manipulation of motivation orientation, cognitive load, or any of the interactions, $F$'s < 1.430.

Participants on average recalled 22.41 numbers from the load manipulation correctly. Only the load manipulation influenced the number of correct recalls. Participants correctly recalled two digit numbers more often ($M = 23.95, SD = 4.21$) than five digit numbers ($M = 20.78, SD = 6.54$), $t(140) = 3.44, p = .001$.

*RAT performance.* On average, participants solved 7.53 ($SD = 1.97$) easy, 4.88 ($SD = 1.89$) moderately difficult, and 1.49 ($SD = 1.30$) difficult RAT items. The data were
analyzed using a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) x 2 (cognitive load: low vs. high) between-subjects ANOVA.

Performance on the easy RAT items was influenced by time pressure, motivational orientation, and cognitive load: participants solved fewer easy RAT items under high time pressure ($M = 7.19, SD = 2.22$) than under low time pressure ($M = 7.87, SD = 1.61$), $F(1,134) = 4.69, p = .032, \eta^2 = .03$, solved fewer easy RAT items under avoidance ($M = 6.88, SD = 2.26$) than approach motivation ($M = 8.14, SD = 1.41$), $F(1,134) = 16.09, p < .001, \eta^2 = .11$, and solved fewer easy RAT items under high load ($M = 7.16, SD = 2.05$) than low load ($M = 7.88, SD = 1.83$), $F(1,134) = 4.43, p = .037, \eta^2 = .03$. Performance on the easy RAT items was not predicted by any of the interactions.

Performance on the difficult RAT items was only influenced by cognitive load: participants solved fewer difficult RAT items under high load ($M = 1.15, SD = 1.13$) than under low load ($M = 1.80, SD = 1.37$). Performance on the difficult RAT items was not influenced by time pressure, motivational orientation, or any of the interactions.

Performance on the moderately difficult RAT items was influenced by time pressure and cognitive load: participants solved fewer moderately difficult RAT items under high time pressure ($M = 4.36, SD = 1.74$) than under low time pressure ($M = 5.41, SD = 1.91$), $F(1,134) = 12.29, p = .001, \eta^2 = .08$, and solved fewer moderately difficult RAT items under high load ($M = 4.51, SD = 1.91$) than under low load ($M = 5.23, SD = 1.81$), $F(1,134) = 8.08, p = .005, \eta^2 = .06$. There was no main effect for motivational orientation, nor were any of the two-way interactions significant. However, as expected, there was a marginally significant three-way interaction, $F(1,134) = 3.69, p = .057, \eta^2 = .03$. When cognitive load was low, there was an interaction between motivational orientation and time pressure, $F(1,72) = 5.11, p = .027$, but there was no interaction when cognitive load was high, $F(1,68) = .31, p = .58$. Thus, the results of the previous experiments were replicated only under low cognitive load (which maps onto the context of the previous experiments). Participants in the avoidance condition solved fewer moderately difficult RAT items under high time pressure ($M = 4.06, SD = 1.75$) than under low time pressure ($M = 6.12, SD = 1.54$), $F(1,72) = 12.59, p = .001$. In contrast, in the approach condition there was no difference in performance under low or high time pressure, $F(1,72) = .25, p = .62$, see Figure 4.5.

Stress-related emotions. A 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) x 2 (cognitive load: low vs. high) between-subjects ANOVA predicting cheerfulness, dejection, quiescence, and agitation revealed that
participants in the avoidance condition reported less quiescence than participants in the approach condition \((M = 4.86, SD = 1.00\ vs.\ M = 5.17, SD = 1.00)\), \(F(1,134) = 4.01, p = .047, \eta^2 = .03\). Participants in the high load condition reported less cheerfulness \((M = 4.51, SD = 1.08\ vs.\ M = 5.02, SD = .86)\), \(F(1,134) = 8.25, p = .003, \eta^2 = .06\), and less agitation\(^5\) \((M = 4.39, SD = .87\ vs.\ M = 4.70, SD = .80)\), \(F(1,134) = 4.58, p = .034, \eta^2 = .03\), than participants in the low load condition. There were no other main effects on mood. There was an interaction of motivational orientation and time pressure on cheerfulness, \(F(1,134) = 5.25, p = .024, \eta^2 = .04\), showing a negative effect of high (compared to low) time pressure in the approach condition, and a positive effect in the avoidance condition. Again, we have no indication that the decline in performance of avoidance motivated individuals under high time pressure was due to heightened stress-related emotions.

*Figure 4.5.* Number of correctly solved moderately difficult RAT items (+SE) in Experiment 4.5.

**Motivation strength.** In general, participants indicated that they were strongly motivated to do the RAT \((M = 6.04\), which is significantly higher than 4, the midpoint of the scale, \(t(141) = 32.16, p < .001\). Moreover, a 2 (time pressure: low vs. high) x 2 (motivational orientation: approach vs. avoidance) x 2 (cognitive load: low vs. high)

\(^5\)Because of the low reliability of the agitation scale, we also analyzed the data using the separate items ("I felt tense" and "I felt worried"). This analysis showed that participants in the high load condition reported feeling less tense than participants in the low load condition \((M = 4.55, SD = 1.05\ vs.\ M = 4.93, SD = 0.89)\), \(F(1,134) = 5.07, p = .026, \eta^2 = .04\), and no other main effects or interactions.
between-subjects ANOVA predicting motivation strength did not reveal any difference between conditions, indicating that participants were equally motivated in all conditions and avoidance motivated participants did not simply “give up” when confronted with high time pressure.

**Discussion**

Five experiments revealed that performance is particularly undermined by time pressure for avoidance motivated individuals. This was the case whether avoidance motivation had a dispositional basis or was situationally induced. This effect was found for performance on tasks that did not fit avoidance motivation well because they required flexibility and creative insight, and on tasks that did fit avoidance motivation well because they required basic analytical thinking and careful attention to detail. We did not find evidence in favor of an emotion-based account of these findings, but rather found evidence that the effect is a function of the availability of cognitive resources. Avoidance motivation evokes a focused, systematic processing style that is resource demanding, making it vulnerable to other factors such as time pressure that also compete for the limited cognitive resources available for task engagement.

People are often confronted with time pressure in everyday achievement situations, such as deadlines for handing in school assignments or for finishing reports at work. As such, the present research is not just of theoretical importance for understanding the nature of avoidance motivation, but is also of clear practical importance. Other research in applied (specifically, work) domains has shown that working under time pressure has deleterious implications for performance because it increases worker anxiety (Baer & Oldham, 2006; Byron et al., 2010). The present research focuses on the interactive influence of time pressure and aversive traits and states more generally (i.e., avoidance motivation), showing that the confluence of these factors is particularly problematic for performance outcomes. Future work is needed to test the generalizability of these findings beyond the controlled laboratory environment to real-world achievement settings like the workplace or the classroom.

The present research sheds light on how individual differences influence the way that people respond to time pressure. Our results indicate that avoidance temperament influences how well people are able to cope with time pressure; specifically, individuals high in avoidance temperament are especially susceptible to the negative consequences of time pressure. Future research would do well to focus on ways to protect people with high avoidance temperament from these negative consequences. One
straightforward way of addressing this issue is to teach individuals high in avoidance temperament techniques for effective time management that may reduce their susceptibility to time constraints. Alternatively, framing deadlines in terms of approach motivation may reduce the negative consequences of working under high time pressure. For example, instead of emphasizing the negative consequences of not handing in a report before a deadline, people could be encouraged to do the best they can within a given time limit. Individuals with high avoidance temperament could also be encouraged to pursue approach goals in the service of their dispositional avoidance tendency (i.e., striving to approach success in order to avoid failure), which has been found to lessen the negative implications of avoidance motivation; Elliot & Church, 1997). Motivation entails multiples levels of representation and operation, meaning dispositional tendencies, even if biologically-based, are not destiny, but may be effectively regulated through the use of lower-level goals, strategies, and tactics (Elliot, 2006; Scholer & Higgins, 2008).

Our research was primarily designed to investigate the joint influence of high time pressure and avoidance motivation on task performance. However, we also included some measures and manipulations designed to begin examining the “second generation” question (Zanna & Fazio, 1982) of the processes underlying the focal effect. Our last experiment provided evidence for a cognitive meditational process, in accord with our conceptual framework. We contend that performance under avoidance motivation relies more on cognitive control and the recruitment of cognitive resources than performance under approach motivation. Therefore, factors that occupy or expend cognitive resources should be particularly problematic for performance outcomes when people are avoidance motivated. We found that the undermining effect of time pressure for avoidance motivated individuals appeared only when sufficient cognitive resources were available. When confronted with high cognitive load, the performance of avoidance motivated individuals was not much better when working under low rather than high time pressure, because they already lacked the cognitive resources necessary for optimal performance. It was under low cognitive load, when cognitive resources were readily available, that the combination of high time pressure and avoidance motivation was shown to be particularly deleterious. This finding supports the idea that the undermining effect of time pressure for avoidance motivated individuals is caused by limited access to cognitive resources. This suggests that not only time pressure, but also other types of pressure, such as that evoked by high expectations, a strong evaluative emphasis, dispositional perfectionism, or low perceptions of one’s skills and abilities (Dweck, 1999; Greenberger, Lessard, Chen, &
Motivated Creativity

Farruggia, 2008; Harackiewicz & Sansone, 1991; Stoeber & Eismann, 2007) may undermine the performance of avoidance motivated individuals more than approach motivated individuals.

The present experiments did not provide evidence that stress-related emotions are responsible for the performance decrement for avoidance motivated people under high time pressure. It is possible that avoidance motivated individuals did not experience more stress under high time pressure than approach motivated individuals. It is also possible that approach and avoidance motivated individuals experience similar stress-related emotions when working under high time pressure, but for avoidance motivated individuals this stress interferes more with performance because their performance relies more on cognitive control and the availability of cognitive resources. It should be noted that our experiments did not find clear evidence that time pressure per se increased stress-related emotions. This raises the question of whether our null findings for stress-related emotions may be due to our use of a self-report assessment that is not sensitive enough to capture ongoing, but implicit, stress-related processes. Other indicators of stress or threat, such as cardiovascular reactivity or cortisol levels (Berry Mendes, McCoy, Major, & Blascovich, 2008; Taylor et al., 2008; 2010) may be more sensitive in detecting differences in stress levels between conditions, and may shed additional light on the issues under consideration. Alternatively, the undermining effect of time pressure for avoidance motivated individuals may be entirely due to cognitive processes, as suggested by the results of Experiment 4.5. Future research is needed to further clarify the processes underlying the observed effect.

Research on avoidance motivation has shown that it can be useful, in that it mobilizes energy for the purpose of averting dangers and losses and it evokes a form of cognitive processing that is beneficial for some types of tasks (Friedman & Förster, 2005; Koch et al., 2008; Roskes et al., 2012a). However, the present research highlights the fact that avoidance motivation is also quite fragile and costly, and often leads to deleterious consequences. Indeed, our research joins a growing body of work showing that avoidance motivation represents a psychological vulnerability, in that it is problematic for task absorption, performance, and intrinsic interest for some tasks in the short run (Elliot & Harackiewicz, 1996; Friedman & Förster, 2002; Sligte et al., 2011), and it is inimical for many, if not most, performance and well-being outcomes in the long run (De Lange et al., 2010; Elliot & Sheldon, 1997; Oertig et al., in press). Our work highlights the fragility of avoidance motivation in that it shows deleterious consequences for performance attainment even when the task requirements at hand
Avoidance motivation is certainly necessary and valuable in the self-regulation of everyday behavior, but given its nature and implications, it seems best that it be used (and encouraged) sparingly.
Chapter Five

Understanding Creative Processes affects Creativity Judgments
Motivated Creativity

Judgments of creativity determine which business start-ups receive financial support, which movies win the Academy Award, which restaurants receive Michelin stars, and which research is funded. Gaining understanding of the psychological processes underlying creativity judgment thus is crucial not only for advancing theory, but also to assist in evaluating ideas and products in an unbiased way. Does it make a difference when people are judging a product with, or without knowledge of the process through which it was achieved? On the one hand, it is possible that knowledge of the process that led up to a product increases respect and appreciation for the product, leading to higher creativity judgments. On the other hand, understanding the process through which a product came about may make the product seem more predictable and mundane, leading to lower creativity judgments. Here, we investigate how knowledge about the process through which products were realized influences creativity judgments. Addressing this issue, we first discuss two distinct processes that can result in creative output. Then we continue with discussing how insights from the hindsight bias literature can help to predict how knowledge of the process through which creative output was achieved may influence creativity judgments.

A growing body of literature shows that creative outcomes can be the result of two distinct cognitive processes—people are able to come up with ideas that are equally creative by objective standards by (1) engaging in flexible thinking and exploring many different cognitive categories and approaches (e.g., Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Winkielman et al., 2003), as well as (2) systematic thinking and exploring a few cognitive categories or approaches systematically and in-depth (e.g., De Dreu et al., 2008; Dietrich & Kanso, 2010; Goldenberg & Mazursky, 2000; 2002; Roskes et al., 2012a; Sagiv et al., 2010). Even though both processes can lead to equally creative outcomes (e.g., ideas, insights, or drawings), we expect that creativity judgments may be differentially influenced by knowledge that a certain product resulted from a flexible or a systematic process. Ideas that are generated through a flexible way of thinking or sudden insights are surprising and seem to come ‘out of the blue’. When the exact same ideas are generated through a persistent and systematic way of thinking, it is easier to follow the reasoning and understand how someone came up with the ideas. In turn, this may make the idea seem more ordinary or predictable, and therefore less creative.

Hindsight Bias and Creativity Judgments

Our idea that the extent to which people can understand the process that led to a product or idea influences their evaluation of the product or idea resonates with
The hindsight bias is prevalent especially when an outcome appears to be a logical result of preceding events, i.e., when one in hindsight can reconstruct how a process led up to a specific outcome. In contrast, when an outcome appears to be the result of unforeseeable chance, hindsight bias is considerably reduced. For example, Wasserman, Lempert, and Hastie (1991) provided different people with the same outcome information (e.g., the British won the British-Ghurka war in 1814) but this outcome either was the result of unforeseeable chance (a sudden unseasonal rainstorm) or the result of a plausible deterministic cause (superior discipline of the troops). When the outcome was described as having a deterministic cause, participants showed a hindsight bias in their judgments of how likely the outcome was. In contrast, being confronted with unexpected or surprising outcomes leads to a reversed hindsight bias. When people are highly surprised by an outcome, they selectively retrieve information from memory that stresses the low plausibility of the outcome (Müller & Stahlberg, 2007). When judging the a priori likelihood of an unexpected outcome, people’s misattribution of their surprise or inability to understand the logic of the events leading to the outcome, leads them to conclude that they “would never have known it” (Mazursky & Ofir, 1990; Müller & Stahlberg, 2007; Pezzo, 2003).

As mentioned, creative ideas can be the result of sudden insights and an associative way of thinking, but also from a persistent and systematic way of thinking (see De Dreu et al., 2008 for a summary). When thinking flexibly, many different cognitive categories and approaches are explored, and outputs (e.g., ideas) often shows internal dissimilarities. Because successively generated ideas are drawn from different cognitive categories, flexible idea generation appears relatively random and hard to
Motivated Creativity

predict (Baas, De Dreu, & Nijstad, in press). A persistent and systematic way of thinking, on the other hand, leads to in-depth exploration of a limited number of cognitive categories. Outputs that are generated in a structured and persistent way thus often shows internal similarities (Cacioppo, von Hippel, & Ernst, 1997). Because successively generated ideas are drawn from the same semantic category, systematic ideation appears relatively structured, organized, and predictable (Baas et al., in press).

The above suggests that understanding how ideas or products were generated influences the extent to which these ideas or product are judged as creative. Specifically, we propose that when a process leading to an outcome is easy to follow (because it is logical and systematic), and when people can understand how the process resulted in a particular outcome, people may feel that they would have come up with the exact same outcome, and perceive the outcome as relatively foreseeable, unoriginal, and uncreative. When a process leading to the same outcome is not easy to follow (because it is unexpected and relatively unsystematic), and when people have difficulty understanding how the process resulted in a particular outcome, people may feel they would never have thought of this outcome, and perceive the outcome as relatively surprising, original, and creative. In other words, we expect that creativity judgments are influenced by knowledge of the process leading to the judged outcomes. This influence may have unwanted effects on decisions that (partly) rely on creativity assessments (see Christensen-Szalanski & Willham, 1991). This follows the suggestion of Conley (2011), who noted that due to hindsight bias, the current process through which patent protection is awarded may “deny patent protection for logically guided research, while rewarding patent protection for inventions obtained through irrational behavior or luck” (p.2).

In three experiments we test the hypothesis that providing people with information indicating a systematic (and in hindsight easy to follow) process leads to lower creativity judgments than providing people with information indicating a flexible (and in hindsight hard to follow) process. Critically, in the current research we compare creativity judgments of the exact same outcomes but vary information about the process through which the outcomes were produced. We test whether people integrate the process leading to an idea (or product) into their judgment of whether the idea (or product) is creative or not.
Hindsight Bias in Creativity Judgments

Experiment 5.1

We expect that after people are informed about an outcome as well as the events leading up to the outcome, people tend to feel that they knew all along what would happen when they can easily reconstruct how the preceding events led to the outcome. We asked participants to evaluate a painting (“Dutch Interior” by Joan Miró), after showing two of the sketches that Miró made in preparation for this work. We expected that when people could easily reconstruct how the sketches eventually resulted in the painting (i.e., when the sketches look similar to aspects of the evaluated painting vs. when the sketches looked dissimilar to the evaluated painting), they would judge the painting as less creative.

Fifty-seven students (40 female, $M_{age} = 19.49, SD = 1.58$) participated in the experiment for course credits. Four participants that were non-native Dutch speakers were excluded from the analyses, to ensure that all instructions and questions were clear to all. Participants were first presented with two sketches that Miró made for this painting. These sketches either looked relatively similar to the target painting or looked relatively dissimilar to the target painting. Participants judged (on a 7-point scale ranging from 1 = not at all to 7 = very much) the same target painting as less creative ($M = 5.35, SD = 1.29$ vs. $M = 6.07, SD = 1.04$), $F(1,51) = 5.13, p = .028, \eta^2 = .09$, less original ($M = 5.12, SD = 1.61$ vs. $M = 6.11, SD = .80$), $F(1,51) = 8.24, p = .006, \eta^2 = .14$, and less meaningful ($M = 2.46, SD = 1.21$ vs. $M = 3.56, SD = 1.50$), $F(1,51) = 8.50, p = .005, \eta^2 = .14$, when it was presented after two sketches that were relatively similar to the target painting than when it was presented after two sketches that were relatively dissimilar to the target painting (see Table 5.1 for the judgments in all experiments).

Experiment 5.2

In Experiment 5.1 participants judged one and the same painting as less creative when it seemed to be the result of a systematic and incremental rather than a flexible and divergent thought process. Experiment 5.2 extends these findings by focusing on the evaluation of ideas of others.

Sixty-six students (49 female, $M_{age} = 21.68, SD = 6.0$) participated in the experiment for course credits. Four participants that were non-native Dutch speakers were excluded from the analyses. Participants read a short story in which the main character, the wolf in the fairytale of the wolf and the seven goats, came up with three different ideas to achieve a goal (i.e., entering the house with the little goats). The ideas were either similar (the wolf covered his ears with flour, covered his tail with flour, and
Motivated Creativity

covered his paw with flour to make it white and look like he was mother goat) or
dissimilar (the wolf lied to the goats about being mother, ate chalk to change the pitch
of his voice, and covered his paw with flour). Participants evaluated (1 = not at all, 7 =
very much) the same final idea (to cover his paw with flour) as less creative ($M = 5.22,$
$SD = 1.07$ vs. $M = 6.00, SD = .83$), $F(1,60) = 10.22, p = .002, \eta^2 = .15,$ and less clever ($M =
5.56, SD = 1.22$ vs. $M = 6.23, SD = 1.04$), $F(1,60) = 5.41, p = .023, \eta^2 = .08,$ when it was
presented after similar ideas than when it was presented after dissimilar ideas. The
effect on perceived originality was in the expected direction but not significant ($M =
5.13, SD = 1.31$ vs. $M = 5.67, SD = 1.18$), $F(1,60) = 2.90, p = .094, \eta^2 = .05.$ Thus, people
were less impressed by an idea that was generated in a persistent and systematic
manner (i.e., exploring only one category in-depth) than by the same idea if it was
generated in a more flexible and associative manner (i.e., exploring many different
categories).

Table 5.1.
Creativity judgments in all experiments

<table>
<thead>
<tr>
<th></th>
<th>Flexible process</th>
<th>Systematic process</th>
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<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
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<tr>
<td>Experiment 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative</td>
<td>6.07</td>
<td>1.04</td>
</tr>
<tr>
<td>Original</td>
<td>6.11</td>
<td>0.80</td>
</tr>
<tr>
<td>Meaningful</td>
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<td>1.50</td>
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<tr>
<td>Experiment 2</td>
<td></td>
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</tr>
<tr>
<td>Creative</td>
<td>6.00</td>
<td>0.83</td>
</tr>
<tr>
<td>Original</td>
<td>5.67</td>
<td>1.18</td>
</tr>
<tr>
<td>Clever</td>
<td>6.23</td>
<td>1.04</td>
</tr>
<tr>
<td>Experiment 3</td>
<td></td>
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<tr>
<td>Creative</td>
<td>4.42</td>
<td>1.47</td>
</tr>
<tr>
<td>Original</td>
<td>3.92</td>
<td>1.47</td>
</tr>
<tr>
<td>Clever</td>
<td>5.65</td>
<td>1.23</td>
</tr>
</tbody>
</table>

Experiment 5.3

The results of Experiment 5.2 revealed that people evaluated ideas as less
creative when they were preceded by ideas that shared characteristics with the idea
that was being evaluated. These results, however, may be criticized because original
ideas must be different from existing ideas. Furthermore, participants may have known
the story about the wolf and the seven goats by the Grimm brothers and have
recognized the original story (as reflected in the flexible-condition) which may have influenced the results. Finally, the creativity of the preceding ideas may have differed in both conditions and it would be desirable to keep creativity level constant across conditions. Please note, however, that possible differences in creativity of preceding ideas should be irrelevant to evaluations of the target idea, which was the same across conditions. To address these potential limitations, Experiment 5.3 used an alternative method in which participants evaluated ideas that were generated by other participants during an individual brainstorm task that were equally creative across conditions.

Fifty-seven students (39 female, $M_{\text{age}} = 19.91$, $SD = 2.25$) participated in the experiment for course credits. Five participants that were non-native Dutch speakers were excluded from the analyses. The participants were asked to evaluate an idea that was generated by another participant during an individual brainstorm session in which ideas to protect the environment were typed into a computer for eight minutes (Roskes et al., 2012a, Experiment 1). Before the target idea that was to be judged appeared on the screen, the five preceding ideas were presented one by one. The ideas either reflected a flexible way of thinking (i.e., ideas in many different categories—aimed at achieving many different types of environmental goals), or a structured way of thinking (i.e., many ideas within few categories—aimed at achieving only a few different environmental goals). The preceding ideas in the flexible condition were: Turn off the car engine when standing still to reduce air pollution, wash laundry on a lower temperature to save energy, recycle glass to reduce waste, two-sided printing to protect forests, and live close to work to reduce the use of natural resources. The preceding ideas in the structured condition were: Introduce a maximum daily amount of energy that people may use to save energy, improve housing insulation to save energy, remove street lights at night to save energy, introduce standing places in airplanes to reduce air pollution, use motion-sensors for light and heating to save energy. The preceding ideas were selected to be equally creative across the conditions, each idea was matched with an equally original idea in the other condition (as indicated by the originality scores in Roskes et al., 2012a, Experiment 1; that is the proportion of people in the complete sample that came up with the given idea).

The final target idea that was to be judged in both conditions was: turn off the TV instead of using standby to save energy. Participants evaluated (1 = not at all, 7 = very much) the same target idea as less creative ($M = 3.35$, $SD = 1.65$ vs. $M = 4.42$, $SD = 1.47$), $F(1,50) = 6.17$, $p = .016$, $\eta^2 = .11$, less original ($M = 3.04$, $SD = 1.56$ vs. $M = 3.92$, $SD = 1.47$), $F(1,50) = 4.43$, $p = .040$, $\eta^2 = .08$, and less clever ($M = 4.81$, $SD = 1.70$ vs. $M = 5.65$, $F(1,50) = 4.43$, $p = .039$, $\eta^2 = .08$).
Motivated Creativity

$SD = 1.23, F(1,50) = 4.23, p = .045, \eta^2 = .08$, when the idea followed from a relatively systematic sequence than when it followed from a relatively flexible sequence.

Discussion

Artists, such as writers and painters, sometimes cultivate mysteries surrounding the creation process, stressing that their creative breakthroughs were the result of divine inspiration and flashes of insight. Indeed, our findings suggest that this mystification may help them to achieve public praise. We showed that when evaluating creativity, people tend to take into account not only the outcomes, but also the processes that led to the outcomes. Understanding, in retrospect, the thought process leading to a novel product leads to lower creativity judgments than situations in which the thought process leading to a novel product is difficult to follow. Products that appeared to be the result of a persistent and systematic process were consistently evaluated as less creative than the exact same product or idea if it appeared to be the result of a more flexible, divergent, and associative process.

An intriguing implication of this effect is that managers in need of creative solutions from their employees, teachers evaluating the creativity of their pupils’ writings, and policy makers deciding how to distribute financial resources among scientists and entrepreneurs, may be better able to evaluate the creative merits of these outputs without knowledge of the process through which they came about. Knowledge of the process leading up to an output may cause uncreative outputs to be over evaluated when they stem from a flexible and associative process that is difficult to follow, because an inability to understand how a process resulted in a specific outcome may cause a reversed hindsight bias and lead people to think that they never would have seen that coming (Mazursky & Ofir, 1990; Müller & Stahlberg, 2007; Pezzo, 2003). Additionally, highly creative outputs may go unnoticed when they are the result of a systematic process that in hindsight is easy to follow and thus seems predictable and unoriginal. These judges of creativity may overlook a brilliant idea or product because it was generated in systematic, organized, and structured way, and thus seem to do nothing more than “build on earlier work.”

A second implication relates to the conceptualization of creativity. Creativity can be conceptualized as a process (i.e., creative vs. non-creative thinking) or as outputs such as products or ideas that can be evaluated on creativity (Goldenberg et al., 1999). In the scientific study of creativity, conceptualizing creativity as outputs may be more useful than conceptualizing creativity as a process, as it is hard (if at all possible) to
assess the creativity of a process without looking at the result (see Goldenberg et al., 1999; Csikszentmihalyi, 1996). Separating creative vs. non-creative outputs from creative vs. non-creative thinking enables a true test of the possibility that creative products and ideas must be originating from a radically different process than non-creative ideas because the result is so different and unique.

Our work has a third implication by contributing to the discussion of how creativity should be evaluated. Creativity judgments are largely subjective, and consensual assessment by judges is a common and widely accepted method of assessing creativity (Baer, Kaufman, & Gentile, 2004; Dollinger, Urban, & James, 2004; Hennessey & Amabile, 1999). Subjective judgments of creativity determine which business start-ups receive financial support, which movies win the Academy Award, which restaurants receive Michelin stars, and which research is funded. Similarly, in many scientific studies on creativity, expert or lay judges assess the creativity of outputs such as ideas generated in brainstorm sessions (Bechtoldt, Choi, & Nijstad, 2012), drawings (Eisenberger & Selbst, 1994), collages (Amabile, 1982), stories (Amabile, Hennessey, & Grossman, 1986), or music pieces (De Dreu et al., 2012). Following the definition of creativity as outputs that are both original and appropriate, subjective judgments of creativity of ideas are indeed positively influenced by both the originality and appropriateness of those ideas (Runco & Charles, 1993). Recent work, however, shows that these subjective judgments are influenced by characteristics of the judges, such as individual differences in openness to experience (Silvia, 2008), level of expertise (Kaufman & Baer, 2012), and the judges’ creative ability (Caroff & Besançon, 2008).

Our current findings suggest that also contextual factors, such as knowledge of the process through which outcomes were generated can influence creativity judgments. Unfortunately, it is hard to reduce hindsight bias (for a meta analysis see Guilbault, Bryant, Brockway, & Posavac, 2004). For example, making people aware of this bias, does not decrease hindsight bias. We suggest that in order to achieve more reliable judgments, objective indicators of creativity could be used, such as objective originality or infrequency of ideas. When objective measures are not feasible or desirable, the process through which outputs were produced can be made invisible. For example, when judging ideas that generated during a brainstorm session, the ideas could be shuffled before they are judged as to conceal the order in which they were generated.
Finally, our work has a fourth implication by contributing to understanding why people are only modestly able to identify their own most creative ideas (Faure, 2004; Rietzschel, Nijstad, & Stroebe, 2010). When people have worked systematically toward a certain outcome, they may not recognize the creativity of this outcome due to knowing the process that step by step led up to this outcome. In contrast, people may overestimate the creativity of ideas that suddenly occurred to them.

Studies on the hindsight bias showed that people perceived general-knowledge questions as easier after they learn the answers, but obviously the questions themselves did not become easier for people who were not provided with the answers. Learning about both a series of events, and the result of these events, makes the result seem more predictable and less surprising, especially when the result seems to be a logical consequence of the preceding events. People fail to recognize that they only understood the outcome in hindsight. The after-the-fact acquired outcome information is automatically integrated with one’s knowledge of the events preceding the outcome (Fischhoff, 1975; Hawkins & Hastie, 1990). Here we found evidence that creativity judgments are influenced by hindsight bias in a similar way. When people can easily follow the process leading up to a certain outcome, because it is systematic, they feel that this outcome was relatively predictable and unoriginal. When people cannot easily follow the process leading up to a certain outcome, because it is relatively unsystematic, they feel that this outcome was more surprising and original.
Chapter Six

General Discussion
This dissertation developed a conservation of energy principle to explain how approach and avoidance motivation affect performance. This principle is based on the idea that people are reluctant to invest energy, unless the benefits of this investment outweigh the costs. Further, when people do decide to invest energy and exert effort, this leads to depletion. One theoretical chapter addressed the conservation of energy principle and its implications in-depth. Three empirical chapters presented 13 experiments testing ideas following from this principle. Results showed that people performed equally well on creative, analytical, and detail oriented tasks when they were avoidance motivated as when they were approach motivated, but only when sufficient cognitive resources were available and when task performance was functional for goal achievement. After task performance, avoidance motivated people were relatively depleted, indicating that for them task performance was relatively effortful and cognitively taxing. In this chapter I first discuss the core findings and conclusions related to the conservation of energy principle (Chapters 2-4), and provide directions for future research. Then I discuss the findings related to creativity judgments (Chapter 5), and their implications.

Conservation of Energy Principle: Core Findings and Conclusions

The conservation of energy principle builds on research showing that, compared to approach motivation, avoidance motivation evokes a systematic and persistent cognitive processing style, and leads to heightened cognitive control (Friedman & Elliot, 2008; Friedman & Förster, 2002; Koch et al., 2008; 2009; Miron-Spektor et al., 2011). The principle is based on three assumptions: (1) performance under avoidance motivation relies more heavily on the recruitment and availability of cognitive resources than performance under approach motivation, making (2) performance under avoidance motivation relatively demanding, and (3) people reluctant to spend their energy and resources unless the benefits of these investments outweigh the costs.

The conservation of energy principle was developed fully in Chapter 2, which put forward three propositions derived from this principle. Specifically, Chapter 2 proposes that compared to approach motivated people, avoidance motivated people (1) carefully select situations in which they exert such cognitive effort, (2) perform well in the absence of distracters that occupy cognitive resources, and (3) become depleted after exerting such cognitive effort. Although these core propositions are likely to operate in different types of tasks, the differential effects of approach versus avoidance motivation can be expected to become manifest especially in those tasks that are ill-suited for
avoidance motivated individuals. One particularly relevant class of tasks are those related to creativity.

**Investing in creativity**

An abundant amount of research shows that approach motivation tends to enhance, whereas avoidance motivation tends to reduce creativity (Cretenet & Dru, 2009; Elliot et al., 2009; Friedman & Förster, 2002; Mehta & Zhu, 2009). This difference is commonly explained as due to the persistent processing style evoked by avoidance motivation. Indeed, systematic, controlled, and rigid way of thinking has often been associated with lower levels of creativity and insight (Elliot, Gable, & Mapes, 2006; Friedman & Förster, 2002; 2005a; 2005b; Koch et al., 2008; 2009; Kuschel et al., 2010).

The Dual Pathway to Creativity Model (De Dreu et al., 2008), however, predicts that creative performance can be the result of flexible processing, but also of persistent processing. These predictions are based on work that shows that stimulating flexible and associative thinking can enhance creative performance (Duncker, 1945; Oppenheimer, 2008; Simonton, 1997; Winkielman et al., 2003) but also stimulating persistent and systematic thinking can enhance creative performance (Dietrich, 2004; Dietrich & Kanso, 2010; Finke, 1996; Rietzschel et al., 2007; Sagiv et al., 2009). Based on the Dual Pathway to Creativity Model, in Chapter 3 we proposed that when people are avoidance motivated (and have a relatively persistent processing style) they *can be as creative as when they are approach motivated (and have a relatively flexible processing style).* However, from the conservation of energy principle, it follows that creative performance is relatively demanding when people are avoidance motivated, because they have to invest more energy and cognitive resources to achieve high levels of creative performance than when they are approach motivated. Therefore, especially when avoiding negative outcomes (as compared to approaching positive outcomes) creativity is stimulated when performing creatively facilitates goal achievement (see proposition 1; Chapter 2).

Chapter 3 reported five experiments in which approach and avoidance motivation was evoked by framing instructions in terms of approach or avoidance (e.g., “Try to find as many words as possible” versus “Try to miss as few words as possible”), or by visual cues (i.e., a mouse trying to approach a piece of cheese versus a mouse trying to avoid being eaten by an owl). In each of these experiments, for half the participants creative performance did not serve goal progress, and for half the participants it did serve goal progress. We predicted that avoidance motivated people in particular should be stimulated to invest in creative activity when it served goal
Motivated Creativity

progress, whereas approach motivated people, for whom creativity is relatively effortless, should always be relatively creative.

Results across the five experiments showed that approach motivated people outperformed avoidance motivated people on creative tasks when creativity did not serve goal progress. However, when creativity was useful, and served goal progress, both approach- and avoidance-motivated people were equally creative. For example, in Experiment 3.4, participants were asked to solve creative insight problems. When solving the problems did not help a mouse to get closer to a piece of cheese (or away from an owl), participants in the approach condition were more creative than those in the avoidance condition. However, when solving problems was useful, and helped the mouse to get closer to the cheese (or stay away from the owl) participants in the approach and avoidance conditions solved the same amount of creative insight problems. It thus appears that avoidance-motivated people were reluctant to exert effort and invest energy necessary for creative performance, unless creativity served their (avoidance) goals.

Furthermore, according to the conservation of energy principle, people should be more easily cognitively overloaded when they are avoidance rather than approach motivated when faced with resource-consuming distracters (proposition 2; Chapter 2). Indeed, the results of Experiment 3.4 showed that when people were avoidance motivated, their creative performance was undermined more by working under a high cognitive load (i.e., memorizing 5-digit numbers while solving creative insight problems) than when they were approach motivated. Finally, if performance of avoidance motivated people depends more on recruitment of cognitive resources and control, creative performance should be more depleting for avoidance than approach motivated people (proposition 3; Chapter 2). As expected, Experiments 3.2a, 3.2b, and 3.3 all showed that avoidance motivated participants felt more depleted after performing creatively than approach motivated participants.

Working under time pressure

From the conservation of energy principle it follows that when cognitive resources are taxed or otherwise unavailable, avoidance motivated individuals should perform less well than those who are approach motivated. Preliminary support for this prediction was already found in Experiment 3.4 (discussed in the previous section). Chapter 4 tested this proposition more extensively by having participants working under low versus high time pressure. Time pressure burdens cognitive resources in two ways. First, the mere experience of time pressure elicits stress and arousal which
consumes cognitive resources (Bargh, 1992; Keinan et al., 1999). Second, time pressure leads to close monitoring of task progress and time remaining, which leads cognitive resources away from the task itself (Karau & Kelly, 1992; Kelly et al., 1997). Thus, from the conservation of energy principle it follows that the detrimental effects of working under a high time pressure will be more pronounced when people are avoidance rather than approach motivated (proposition 2; Chapter 2).

To test the possibility that performance under avoidance motivation suffers more from time pressure than performance under approach motivation, and the robustness of this effect, we investigated performance on tasks that fit (or do not fit) the vigilance and attention to detail that is activated by avoidance motivation. Five experiments thus tested the hypothesis that performance on tasks that rely on creative insight, analytical thinking, and attention to detail, is undermined more by time pressure among avoidance motivated individuals than among approach motivated individuals.

Experiment 4.1 focused on individual differences in the tendency to strive for avoidance goals (i.e., avoidance temperament, Elliot & Thrash, 2002; 2010), and showed that the higher people’s avoidance temperament was, the more performance on a creative insight task was inhibited by working under time pressure. Experiments 4.2 and 4.3 focused on situations in which approach versus avoidance motivation were manipulated within participants, with a task in which they could win points for correct answers on some items and lose points for incorrect answers on other items. These experiments showed a stronger undermining effect of working under a high time pressure under avoidance rather than approach motivation, both for creative insight performance and for analytical performance (i.e., an arithmetic test). Finally, in Experiments 4.4 and 4.5 motivational orientation was manipulated between participants. In Experiment 4.4 participants were asked to write a story from the perspective of a mouse about its efforts to obtain a piece of cheese, or to avoid being eaten by an owl. After writing the story, the participants completed a task that strongly relies on attention to detail, in which they had to locate specific targets among similar looking distracters. Also detail-oriented task performance was undermined more by working under time pressure when people were avoidance motivated than when they were approach motivated.

In Experiment 4.5 participants were again asked to solve creative insight problems, and during this task a mouse and a piece of cheese, or a mouse and an owl, appeared on the screen. The cheese moved closer to the mouse after a correct answer,
and the owl moved closer to the mouse after an incorrect answer, and participants worked under a low or a high cognitive load (similar to the procedure in Experiment 3.4). Supporting the idea that working under a high time pressure is more detrimental when people are avoidance rather than approach motivated due to limited cognitive resources, we only found an undermining effect of time pressure for avoidance motivated people when they worked under a low cognitive load (i.e., when cognitive resources were available). When working memory was occupied by working under a high cognitive load, avoidance motivated individuals performed relatively poorly irrespective of time pressure.

**Conservation of Energy: Implications and Future Directions**

**Intrinsic versus extrinsic motivation**

This dissertation discusses how people behave and think when they are approach motivated and when they are avoidance motivated. However, would it make a difference whether the approach or avoidance goals that people strive for are intrinsically motivating (i.e., the tasks themselves are enjoyable or interesting), or whether people strive for these goals for external reasons such as rewards or approval (Amabile, 1983)? Interestingly, the intrinsic versus extrinsic distinction shares some characteristics with the approach versus avoidance distinction. For example, intrinsic motivation, like approach motivation, has been associated consistently with relatively high levels of creativity. Extrinsic motivation, like avoidance motivation, has often been associated with reduced creative performance (Amabile, 1983; Hennessey & Amabile, 1998), but under specific circumstances also with enhanced creative performance (Eisenberger & Cameron, 1998; Eisenberger & Rhoades, 2001).

To explain why extrinsic motivation sometimes seems to stimulate and sometimes seems to undermine creativity, Roskes, De Dreu, and Nijstad (2012b) hypothesized that intrinsic motivation, like approach motivation, evokes a flexible and associative way of thinking, whereas extrinsic motivation, like avoidance motivation, evokes a systematic and persistent way of thinking. Indeed, in a brainstorm session, intrinsically motivated participants generated ideas in more different cognitive categories, and switched between these categories, demonstrating a relatively flexible processing style. Extrinsicly motivated participants generated many ideas within a few categories, demonstrating a relatively persistent processing style.

Following the conservation of energy principle that is presented in this dissertation, creativity should be relatively difficult and demanding when people are
striving for extrinsic goals than when they are striving for intrinsic goals, because performance under extrinsic motivation (like avoidance motivation) seems to rely more on persistent rather than flexible processing. This implies that extrinsically motivated people (like avoidance motivated people) should be relatively reluctant to invest their energy and cognitive resources in creative performance. Perhaps, extrinsically motivated people are often less creative than intrinsically motivated people because they are more selective in when to invest their energy and resources in creativity. This may explain why providing a reward for simply doing a task leads to lower levels of creativity, while specifically rewarding higher levels of creative performance leads to higher levels of creativity (Eisenberger, Haskins, & Gambleton, 1999; Eisenberger & Rhoades, 2001; Eisenberger & Shanock, 2003). A further implication of this reasoning for future research is that creative performance will be more depleting when people are extrinsically motivated than when they are intrinsically motivated.

Another promising avenue for future research could address the combination of approach versus avoidance and intrinsic versus extrinsic motivation. There already is work showing that goals which are framed in terms of avoidance of failure can undermine intrinsic motivation (Elliot & Harackiewicz, 1996), and that threatening to withhold rewards (i.e., “if you do not perform well enough you will not receive a bonus”) may increase the experience of pressure and decrease task enjoyment (Friedman, 2009). However, it is not yet clear if there are different effects of striving for intrinsic approach goals versus extrinsic approach goals, and of intrinsic avoidance goals and extrinsic avoidance goals, or whether all combinations even exist in the “real world”.

2 X 2 Achievement goal framework

The previous section raises the question whether all approach (or avoidance) goals are equal, and have the same consequences. Within the framework of achievement goal theory, Elliot and McGregor (2001) addressed this question by distinguishing between approach and avoidance goals aimed at developing task competence (mastery goals) and goals aimed at demonstrating competence relative to others (performance goals). This 2 X 2 framework expands previous versions of a trichotomous framework comprising only three achievement goals; performance-approach, performance-avoidance, and mastery goals (Elliot & Church, 1997; Elliot & Harackiewicz, 1996), by also separating mastery goals into mastery-approach and mastery-avoidance goals. Mastery-approach goals are aimed at improving one’s performance, whereas mastery-avoidance goals are aimed at not deteriorating one’s performance. Performance-approach goals are aimed at outperforming others, whereas
performance-avoidance goals are aimed at not performing worse than others. People differ in the extent to which they tend to strive to these four types of goals (Elliot & McGregor, 2001), and often have one dominant goal (Van Yperen, 2006), but also situational influences can evoke specific achievement goals (Elliot et al., 2005; Van Yperen, 2003).

*Mastery-approach* goals are generally viewed as the most optimal goals (Elliot & McGregor, 2001). Striving for mastery-approach goals elicits feelings of excitement, work engagement, motivation to develop one’s skills, and makes people view tasks as a challenge (De Lange et al., 2010; Elliot & Church, 1997; Elliot & McGregor, 2001; Rawsthorne & Elliot, 1999). Mastery-approach goals are further related to positively valenced constructs such as need for achievement, self-efficacy, positive affectivity, and intrinsic motivation (Van Yperen, 2006). People striving for *mastery-avoidance* goals are not interested in how well they do compared to others, and also not motivated to improve their own performance. Compared with the other achievement goals, mastery-avoidance goals are detrimental for performance improvement (Van Yperen, Elliot, & Anseel, 2009). Van Yperen (2006) found evidence that people striving for mastery-avoidance goals neither experience the benefits nor the disadvantages associated with the other achievement goals, because people with a dominant mastery-avoidance goal reported both lower positive affect and lower negative affect. Other research, however, did find a relation between performance avoidance goals and elevated anxiety levels, negative affect, and fair of failure (Sideridis, 2008). Although the relation between mastery-avoidance goals and negative outcomes thus is not yet fully clear, from the current literature we can safely conclude that mastery-avoidance goals do not seem to be related to positive outcomes.

*Performance-approach* goals have been associated with improved performance (Elliot & Church, 1997; Harackiewicz, Barron, Pintrich, Elliot, & Thrash, 2002). However, performance-approach goals come at the cost of lower task interest (Harackiewicz et al., 2002; Elliot & McGregor, 2001), particularly when goals are difficult (Blaga & Van Yperen, 2008), dissatisfaction, and lower quality interpersonal interactions (Janssen & Van Yperen, 2004; Van Yperen & Janssen, 2002). In general, performance-approach goals thus seem to enhance performance, but undermine satisfaction and intrinsic motivation. Finally, *performance-avoidance* goals evoke anxiety, threat appraisal, low competency expectancies, and can cause distraction (Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001). Performance-avoidance goals are seen as the most maladaptive type of achievement goal, because they are related to both worse performance and negative emotional outcomes (Elliot et al., 2005; Van Yperen, 2006).
General Discussion

It would be useful to investigate the consequences in terms of cognitive demands and depletion for the full 2 X 2 goal achievement framework, and to assess whether the achievement goals affect creative performance in the same way as general performance. It is, for example, possible that especially mastery-approach goals have the positive effects of approach goals as documented in this dissertation, whereas performance-approach goals do not. Similarly, the negative effects of avoidance goals may be particularly pronounced for performance-avoidance goals compared with mastery-avoidance goals. These questions remain open for future research.

Levels of approach and avoidance

As mentioned in the introduction to this dissertation, regulatory focus theory distinguishes approach and avoidance on different levels (Scholer & Higgins, 2008). Regulatory focus theory distinguishes two coexisting regulatory systems: A promotion orientation that regulates nurturance needs, and is concerned with growth, advancement, and accomplishment, and a prevention orientation that regulates security needs, and is concerned with safety, and fulfilling one’s duties and responsibilities (Higgins, 1997). Additionally, a distinction is made between desired or undesired end-states (system level), the process of moving towards desired end-states, or away from undesired end-states (strategic level), and the tactics used to serve approach and avoidance strategies (tactic level).

Often approach strategies are used to strive for positive end-states, and approach tactics are used to serve approach strategies, but this does not always need to be the case. In principle, the three levels are independent, and the tactics, strategies, and valence of end-states do not necessarily have to match (Scholer & Higgins, 2008). For example, promotion focused and prevention focused people can strive for the same positive end-state (e.g., a high grade for an exam). Furthermore, promotion focused people are more likely to engage in eager strategies, and focusing on achieving matches with the positive end-state, whereas prevention focused people are more likely to engage in vigilant strategies, and focusing on avoiding mismatches with the positive end-state (Higgins, Roney, Crowe, & Hymes, 1994). However, prevention focused people may adopt approach tactics serving their vigilant avoidance strategies. For example, prevention focused people are generally risk averse, however, they are willing to take risks and incur ‘false alarms’ to ensure that negative stimuli are correctly identified (Scholer, Stroessner, & Higgins, 2008).

Throughout this dissertation approach and avoidance motivation referred to positive outcomes or end-states that people are aiming to approach, or negative
Motivated Creativity

outcomes or end-states that people are aiming to avoid. Chapters 3 and 4 identified costs attached to striving for avoidance goals compared with striving for approach goals. Avoidance goal striving was undermined more by working under a cognitive load or time pressure, and was associated with cognitive depletion. One may wonder how approach and avoidance on levels other than the system level are susceptible for these costs. Could approach strategies or tactics buffer for the negative effects of striving to avoid negative end-states? Could avoidance strategies or tactics undermine the positive effects of striving for positive end-states? Which level is most influential in determining the consequences of approach and avoidance goal striving? These are questions to address in future research.

Related questions that remain open relate to person-situation fit. A range of research has shown that fit between characteristics of situations and individual tendencies can be beneficial. For example, people who frequently experience approach motivation pay more attention to, and are more affected by approach-oriented information, and find this information more useful. For people who frequently experience avoidance motivation the opposite pattern emerges: They pay more attention to, and are more affected by avoidance-oriented information, and find this information more useful (Hamamura, Meijer, Heine, Kamaya, & Hori, 2009). Similarly, promotion focused people are more inspired by positive role models, whereas prevention focused people are more inspired by negative role models (Lockwood & Kunda, 1997). Furthermore, providing people working on promotion-tasks with positive feedback enhances self-reported motivation and performance, whereas providing people working on prevention-tasks with positive feedback lowers motivation and performance (Van Dijk & Kluger, 2011). Potentially, the harmful consequences associated with avoidance goal striving that were identified in this dissertation would be reduced when there is a motivational fit. For example, potentially the negative consequences of striving for avoidance goals are larger for people high in approach temperament than for people high in avoidance temperament.

Evaluating Performance: Outcomes Versus Processes

In the chapters of this dissertation devoted to the conservation of energy principle (Chapters 2-4), we found evidence that people can achieve the same outcomes when they are avoidance motivated as when they are approach motivated, on tasks requiring creative, analytical, and detail oriented performance. We expect that, although avoidance motivated people need to exert more effort to achieve output that is equally creative as the output of approach motivated people, their output may be
valued less. Whereas focusing on outcomes is generally accepted as a good indicator of performance for analytical, and detail oriented tasks, this is not uniformly the case for creative tasks. When evaluating creativity, people tend to take into account not only the outcomes, but also the processes that led to the outcomes. In Chapter 5 we developed the idea that the same creative product can be evaluated quite differently depending on whether it was achieved through persistent and systematic thinking (as is more likely when people are avoidance motivated) compared with more flexible and associative thinking (as is more likely when people are approach motivated). Specifically, we reasoned that when people in hindsight can understand how an idea or product came about, they are less impressed by the idea or product.

The effect that people in hindsight feel that they would have predicted that a certain outcome would occur (after learning about both the events leading up to a certain outcome, and the outcome itself), has been aptly labeled the “knew it all along effect” (Fischhoff, 1975; 1977; Hawkins & Hastie, 1990). Chapter 5 proposed that ideas which are generated through a flexible way of thinking or sudden insights are surprising and seem to come ‘out of the blue’. When the exact same ideas are generated through a persistent and systematic way of thinking, it is easier to follow the reasoning and understand how someone came up with the ideas. In turn, this may make the idea seem more obvious and unsurprising, and therefore less creative.

Results of three experiments supported this “knew-it-all-along” effect in creativity judgments. For example, in Experiment 5.3 participants were asked to evaluate an idea that was generated by another participant during an individual brainstorm session in which ideas to protect the environment were typed into a computer for eight minutes (Experiment 3.1). Before the target idea that was to be judged appeared on the screen, the five preceding ideas were presented one by one. The ideas either reflected a flexible way of thinking (i.e., ideas in many different categories—aimed at achieving many different types of environmental goals), or a structured way of thinking (i.e., many ideas within few categories—aimed at achieving only a few different environmental goals). Results showed that people took into account the process through which the outcome came about when judging its creativity. The exact same idea was evaluated as less creative when it resulted from a structured process than when it resulted from a flexible process.

This effect has implications for people who are producing creative outputs, for people judging creative outputs, and for people studying creativity. For those striving to be recognized for their creative achievements, it seems a good strategy to avoid
explaining to their audience how they reached their final product through a structured
and systematic approach. Indeed, artists, such as writers and painters, sometimes
cultivate mysteries surrounding the creation process, stressing that their creative
breakthroughs were the result of divine inspiration and flashes of insight. Additionally,
that understanding how a process resulted in a specific outcome may contribute to the
quite modest ability of people to identify their own most creative ideas (Faure, 2004;
Rietzschel et al., 2010). When people have worked systematically toward a certain
outcome, they may not recognize the creativity of this outcome because they know the
step-by-step process that led up to this outcome. In contrast, people may overestimate
the creativity of ideas that suddenly occurred to them.

Those judging creative outputs would be better able to evaluate the creative
merits of these outputs without knowledge of the process through which it came about.
Knowledge of the process leading up to an output may cause uncreative outputs to be
over-evaluated when they stem from a flexible and associative process that is difficult
to follow, because an inability to understand how a process resulted in a specific
outcome may cause a reversed hindsight bias and lead people to think that they never
would have seen that coming (Mazursky & Ofir, 1990; Müller & Stahlberg, 2007; Pezzo,
2003). Additionally, highly creative outputs may go unnoticed when they are the result
of a systematic process that in hindsight is easy to follow and thus seems predictable
and unoriginal. People studying creativity need to clearly separate ‘creative processes’
from ‘creative outputs’, as it seems that there are different ways to produce outputs
with equal levels of creativity. Indeed, it may be more useful and feasible to assess the
creativity of outputs rather than processes, as it is hard to assess the creativity of a
process without taking into account the results (Csikszentmihalyi, 1996; Goldenberg et
al., 1999).

Judgments of creativity determine which business start-ups receive financial
support, which movies win the Academy Award, which restaurants receive Michelin
stars, and which research is funded. Similarly, in many scientific studies on creativity,
expert or lay judges assess the creativity of outputs such as ideas generated in
brainstorm sessions (Bechtoldt et al., 2012), drawings (Eisenberger & Selbst, 1994),
collages (Amabile, 1982), stories (Amabile et al., 1986), or music pieces (De Dreu et al.,
2012). What can those in the position of judging creativity do to achieve more reliable
judgments? One solution may be to use objective measures, such as the objective
uniqueness of outputs of the number of correct solutions to problems (as we did in
Chapters 3 and 4). When objective measures are not feasible or desirable, the process
through which outputs were produced can be made invisible. For example, when
General Discussion

judging ideas that generated during a brainstorm session, the ideas could be shuffled before they are judged as to conceal the order in which they were generated.

Concluding remarks

This dissertation developed a novel conservation of energy principle to explain how approach and avoidance motivation influence performance. On the one hand, we showed that avoidance motivated people can excel when they are sufficiently stimulated to invest their energy and cognitive resources. This is the case, for example, when this investment is likely to result in successful avoidance of failure. Even when performance depends on creativity and insight, such stimulation can lead to high levels of performance. Usually creativity and insight are associated with the flexible and associative way of thinking evoked by approach motivation. However, by investing energy and cognitive resources avoidance motivated people can compensate for their systematic and controlled way of thinking, and achieve the same levels of creative performance as approach motivated people.

On the other hand, it appears that Johan Cruijff (quoted in Chapter 1) was onto something when he noted that it is much easier to play well than to prevent playing badly. Although avoidance motivation may be effective in short-term projects due to the recruitment of cognitive resources and control, it may be counterproductive in the long run, when energy gets depleted and people feel mentally exhausted. Even in the short run negative effects of avoidance goal striving may emerge, because it makes people more prone to cognitive overload when facing distracters or stressors. This dissertation shows that performance under avoidance motivation can be effective, but is difficult, depleting, and easily undermined.


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Motivated Creativity


Motivated Creativity


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When making a financial investment, one can consider the chance of a company flourishing and growing and giving a great return on the investment, or the risk of the company failing and losing one’s investment. When deciding what to study after finishing high school, one can consider how interesting the topic of a particular study is and how fun the jobs are that the study prepares for, or how difficult the study is and how unlikely it is to get a job afterwards. When searching for a nice date, one can focus on finding someone with great qualities, or on avoiding people with negative qualities. These examples show how people sometimes strive to achieve success or positive outcomes and at other times strive to avoid failure or negative outcomes.

Does it matter which goals people strive for? Does striving for success lead to better performance than striving to avoid failure? Does striving for positive or avoiding negative outcomes improve performance on different types of tasks? How does working under pressure influence people striving for these different types of goals? Is goal-striving more difficult when striving to avoid negative outcomes than when striving for positive outcomes? This dissertation addresses these and related questions, and advocates a novel conservation of energy principle to explain when striving for positive outcomes (approach motivation) and striving to avoid negative outcomes (avoidance motivation) stimulate performance. This principle is based on the idea that people are reluctant to invest energy, unless the benefits of this investment outweigh the costs. Further, when people do decide to invest energy and exert effort, this leads to depletion.

Based on this principle, we predict that performance under avoidance motivation is more fragile and can be undermined easier than performance under approach motivation, because performance under avoidance motivation relies more heavily on the recruitment of cognitive resources and cognitive control. Or, as put by Johan Cruijff, who used to be one of the greatest soccer players in the world and is known for his philosophical and often oracular one-liners; “Het is veel makkelijker om goed te spelen dan om te voorkomen dat je slecht speelt” (It is much easier to play well than to prevent playing badly; Winsemius, 2012).

Conservation of Energy

The conservation of energy principle builds on research showing that, compared to approach motivation, avoidance motivation evokes a systematic and persistent cognitive processing style, and leads to heightened cognitive control (Friedman & Elliot,
Summary

The conservation of energy principle was developed fully in Chapter 2, which put forward three propositions derived from this principle. Specifically, Chapter 2 proposed that compared to approach motivated people, avoidance motivated people (1) carefully select situations in which they exert such cognitive effort, (2) perform well in the absence of distracters that occupy cognitive resources, and (3) become depleted after exerting such cognitive effort. Although these core propositions are likely to operate in different types of tasks, the differential effects of approach versus avoidance motivation can be expected to become manifest especially in those tasks that are ill-suited for avoidance motivated individuals. One particularly relevant class of tasks are those related to creativity.

Investing in Creativity

Chapter 3 systematically examines the effects of approach and avoidance motivation on creative performance, and the consequences of such performance on depletion. This chapter tests the idea that approach motivation evokes a flexible processing style, and avoidance motivation a persistent processing style, and that both can result in equal levels of creative performance. Following the theoretical framework presented in Chapter 2, we hypothesized that avoidance-motivated individuals are not unable to be creative, but they have to compensate for their inflexible processing style by effortful and controlled processing.

Chapter 3 includes five experiments in which approach and avoidance motivation was evoked by framing instructions in terms of approach or avoidance (e.g., “Try to find as many words as possible” versus “Try to miss as few words as possible”), or by visual cues (i.e., a mouse trying to approach a piece of cheese versus a mouse trying to avoid being eaten by an owl). In each of these experiments, for half the participants creative performance did not serve goal progress, and for half the participants it did serve goal progress. We predicted that avoidance motivated people in particular should be stimulated to invest in creative activity when it served goal
progress, whereas approach motivated people, for whom creativity is relatively effortless, should always be relatively creative.

Results across the five experiments showed that approach motivated people outperformed avoidance motivated people on creative tasks when creativity did not serve goal progress. However, when creativity was useful, and served goal progress, both approach- and avoidance-motivated people were equally creative. For example, in Experiment 3.4, participants were asked to solve creative insight problems. When solving the problems did not help a mouse to get closer to a piece of cheese (or away from an owl), participants in the approach condition were more creative than those in the avoidance condition. However, when solving problems was useful, and helped the mouse to get closer to the cheese (or stay away from the owl) participants in the approach and avoidance conditions solved the same amount of creative insight problems. It thus appears that avoidance-motivated people were reluctant to exert effort and invest energy necessary for creative performance, unless creativity served their (avoidance) goals.

Furthermore, according to the conservation of energy principle, people should be more easily cognitively overloaded when they are avoidance rather than approach motivated when faced with resource-consuming distracters. Indeed, the results of Experiment 3.4 showed that when people were avoidance motivated, their creative performance was undermined more by working under a high cognitive load (i.e., memorizing 5-digit numbers while solving creative insight problems) than when they were approach motivated. Finally, if performance of avoidance motivated people depends more on recruitment of cognitive resources and control, creative performance should be more depleting for avoidance than approach motivated people. As expected, Experiments 3.2a, 3.2b, and 3.3 all showed that avoidance motivated participants felt more depleted after performing creatively than approach motivated participants.

Working under Time Pressure

From the conservation of energy principle it follows that when cognitive resources are taxed or otherwise unavailable, avoidance motivated individuals should perform less well than those who are approach motivated. Chapter 4 tested this proposition by having participants working under low versus high time pressure. Five experiments examined the effects of working under time pressure on performance on a variety of cognitive tasks, including those well suited and those ill suited to the type of information processing evoked by avoidance motivation. These tasks included solving
Experiment 4.1 focused on individual differences in the tendency to strive for avoidance goals (i.e., avoidance temperament, Elliot & Thrash, 2002; 2010), and showed that the higher people’s avoidance temperament was, the more performance on a creative insight task was inhibited by working under a high time pressure. Experiments 4.2 and 4.3 focused on situations in which approach versus avoidance motivation were manipulated within participants, with a task in which they could win points for correct answers on some items and lose points for incorrect answers on other items. These experiments showed a stronger undermining effect of working under a high time pressure under avoidance rather than approach motivation, both for creative insight performance and for analytical performance (i.e., an arithmetic test). Finally, in Experiments 4.4 and 4.5 motivational orientation was manipulated between participants. In Experiment 4.4 participants were asked to write a story from the perspective of a mouse about its efforts to obtain a piece of cheese, or to avoid being eaten by an owl. After writing the story, the participants completed a task that strongly relies on attention to detail, in which they had to locate specific targets among similar looking distracters. Also detail oriented task performance was undermined more by working under a high time pressure when people were avoidance motivated than when they were approach motivated.

This chapter showed that performance is particularly undermined by time pressure when people are avoidance motivated. Performance under avoidance motivation relies more heavily on cognitive control and the availability of cognitive resources than approach motivation. We did not find evidence that stress-related emotions were responsible for the observed undermining effect, but did find evidence that the effect was produced by reduced availability of cognitive resources (Experiment 4.5). The results suggest that avoidance motivation is fragile and costly, and is best used (and encouraged) sparingly.

**Evaluating Performance: Outcomes Versus Processes**

In the chapters of this dissertation devoted to the conservation of energy principle (Chapters 2-4), we found evidence that people can achieve the same outcomes when they are avoidance motivated as when they are approach motivated, on tasks requiring creative, analytical, and detail oriented performance. However, whereas focusing on outcomes is generally accepted as a good indicator of performance for
analytical, and detail oriented tasks, this is not uniformly the case for creative tasks. When evaluating creativity, people tend to take into account not only the outcomes, but also the processes that led to the outcomes. In Chapter 5 we developed the idea that the same creative product can be evaluated quite differently depending on whether it was achieved through persistent and systematic thinking (as is more likely when people are avoidance motivated) compared with more flexible and associative thinking (as is more likely when people are approach motivated). Specifically, we reasoned that when people in hindsight can understand how an idea or product came about, they are less impressed by the idea or product.

The effect that people in hindsight feel that they would have predicted that a certain outcome would occur (after learning about both the events leading up to a certain outcome, and the outcome itself), has been aptly labeled the “knew it all along effect” (Fischhoff, 1975; 1977; Hawkins & Hastie, 1990). Chapter 5 proposed that ideas which are generated through a flexible way of thinking or sudden insights are surprising and seem to come ‘out of the blue’. When the exact same ideas are generated through a persistent and systematic way of thinking, it is easier to follow the reasoning and understand how someone came up with the ideas. In turn, this may make the idea seem more obvious and unsurprising, and therefore less creative.

Results of three experiments supported this “knew-it-all-along” effect in creativity judgments. For example, in Experiment 5.3 participants were asked to evaluate an idea that was generated by another participant during an individual brainstorm session in which ideas to protect the environment were typed into a computer for eight minutes (Experiment 3.1). Before the target idea that was to be judged appeared on the screen, the five preceding ideas were presented one by one. The ideas either reflected a flexible way of thinking (i.e., ideas in many different categories—aimed at achieving many different types of environmental goals), or a structured way of thinking (i.e., many ideas within few categories—aimed at achieving only a few different environmental goals). Results showed that people took into account the process through which the outcome came about when judging its creativity. The exact same idea was evaluated as less creative when it resulted from a structured process than when it resulted from a flexible process.
Conclusion

This dissertation developed a novel conservation of energy principle to explain how approach and avoidance motivation influence performance. On the one hand, we showed that avoidance motivated people can excel when they are sufficiently stimulated to invest their energy and cognitive resources. This is the case, for example, when this investment is likely to result in successful avoidance of failure. Even when performance depends on creativity and insight, such stimulation can lead to high levels of performance. Usually creativity and insight are associated with the flexible and associative way of thinking evoked by approach motivation. However, by investing energy and cognitive resources avoidance motivated people can compensate for their systematic and controlled way of thinking, and achieve the same levels of creative performance as approach motivated people.

On the other hand, it appears that Johan Cruijff was onto something when he noted that it is much easier to play well than to prevent playing badly. Although avoidance motivation may be effective in short-term projects due to the recruitment of cognitive resources and control, it may be counterproductive in the long run, when energy gets depleted and people feel mentally exhausted. Even in the short run negative effects of avoidance goal striving may emerge, because it makes people more prone to cognitive overload when facing distracters or stressors. This dissertation shows that performance under avoidance motivation can be effective, but is difficult, depleting, and easily undermined.
Samenvatting
Bij het kiezen van een financiële investering kan iemand letten op de kans dat een bedrijf succesvol zal zijn, groeit, en een geweldig rendement oplevert, of op het risico dat het bedrijf zal falen en de investering verloren gaat. Bij het kiezen van een studie na afronding van de middelbare school kan iemand overwegen hoe interessant het onderwerp van een specifieke studie is en hoe leuk de banen zijn waarvoor de studie opleidt, of hoe ingewikkeld de studie is en hoe onwaarschijnlijk het is om na afloop een baan te vinden. Bij het zoeken naar een romantische partner kan iemand zich richten op het vinden van personen met veel goede eigenschappen, of op het vermijden van personen met slechte eigenschappen. Deze voorbeelden laten zien hoe mensen soms succes en positieve uitkomsten nastreven, en soms het vermijden van falen of negatieve uitkomsten willen voorkomen.

Maakt het uit welke doelen mensen nastreven? Leidt streven naar succes tot betere prestaties dan streven naar het voorkomen van falen? Leidt het streven naar positieve uitkomsten versus het vermijden van negatieve uitkomsten tot betere prestaties op verschillende soorten taken? Wat is de invloed van werken onder druk op mensen die deze verschillende soorten doelen nastreven? Is het moeilijker om doelen na te streven wanneer men gericht is op het voorkomen van negatieve uitkomsten dan wanneer men gericht is op het behalen van positieve uitkomsten? Dit proefschrift behandelt deze en gerelateerde vragen, en pleit voor een nieuw principe van behoud van energie om te verklaren wanneer het streven naar positieve uitkomsten (streefmotivatie) en het streven naar het vermijden van negatieve uitkomsten (vermijdingsmotivatie) prestaties stimuleren. Dit principe is gebaseerd op het idee dat mensen liever geen energie investeren, tenzij de voordelen van deze investering opwegen tegen de kosten. Als mensen besluiten om energie te investeren en zich ergens voor in te spannen, dan leidt dit vervolgens tot uitputting.

Gebaseerd op dit principe, voorspellen we dat prestatie onder vermijdingsmotivatie fragieler is en makkelijker wordt ondermijnd dan prestatie onder streefmotivatie, omdat prestatie onder vermijdingsmotivatie sterker afhangt van het mobiliseren van cognitieve bronnen en controle. Of, zoals Johan Cruijff, eens één van de grootste voetballers ter wereld en bekend om zijn filosofische en orakelachtige uitspraken, stelde: “Het is veel makkelijker om goed te spelen dan om te voorkomen dat je slecht speelt” (Winsemius, 2012).
Samenvatting

Behoud van Energie

Het principe van behoud van energie bouwt voort op onderzoek dat laat zien dat, vergeleken met streefmotivatie, vermijdingsmotivatie een systematische en volhardende cognitieve verwerkingsstijl teweegbrengt en leidt tot meer cognitieve controle (Friedman & Elliot, 2008; Friedman & Förster, 2002; Koch et al., 2008; Miron-Spektor et al., 2011). Dit principe is gebaseerd op drie aannames: (1) prestatie onder vermijdingsmotivatie is sterker afhankelijk van de aanwezigheid en mobilisatie van cognitieve bronnen dan prestatie onder streefmotivatie, waardoor (2) prestatie onder vermijdingsmotivatie relatief belastend is, en (3) mensen terughoudend zijn om hun energie en moeite te investeren tenzij de voordelen van deze investeringen opwegen tegen de kosten.

In Hoofdstuk 2 wordt het principe van behoud van energie uitgebreid besproken, en worden drie stellingen naar voren gebracht die uit dit principe voortvloeien. Specifiek wordt in Hoofdstuk 2 voorgesteld dat, vergeleken met streefgemotiveerde mensen, vermijdingsgemotiveerde mensen (1) zorgvuldig situaties selecteren waarin zij cognitieve inspanning uitoefenen, (2) goed presteren bij afwezigheid van afleidingen die cognitieve bronnen verbruiken, en (3) uitgeput raken na het uitoefenen van zulke cognitieve inspanningen. Hoewel het aannemelijk is dat deze stellingen van toepassing zijn op verschillende soorten taken, kan men verwachten dat de gevolgen zich vooral manifesteren op die taken die slecht aansluiten bij de denkstijl van vermijdingsgemotiveerde mensen. Een klasse van taken waar dit bij uitstek voor geldt, zijn taken die gerelateerd zijn aan creativiteit.

Investeren in Creativiteit

Hoofdstuk 3 verkent systematisch de effecten van streef- en vermijdingsmotivatie op creatieve prestatie, en de gevolgen van deze prestatie op uitputting. Dit hoofdstuk test het idee dat streefmotivatie een flexibele verwerkingsstijl teweegbrengt, dat vermijdingsmotivatie een systematische verwerkingsstijl teweegbrengt, en dat beide kunnen resulteren in een gelijke mate van creativiteit. Door het theoretisch raamwerk te volgen dat is voorgesteld in Hoofdstuk 2, verwachten we dat vermijdingsgemotiveerde mensen in staat zijn om creatief te zijn, maar dat zij moeten compenseren voor hun inflexibele verwerkingsstijl met inspanning en volharding.

Hoofdstuk drie omvat vijf experimenten waarin streef- en vermijdingsmotivatie teweeg worden gebracht door instructies te geven in termen van streef- of
Motivated Creativity

motivatiedoelen (e.g., “Probeer zoveel mogelijk woorden te vinden” of “Probeer zo min mogelijk woorden te missen”) of door visuele stimuli (e.g., een muis die probeert om dichter bij een stukje kaas te komen, of een muis die probeert te vluchten voor eenuil). In elk van deze experimenten hielp creativiteit de helft van de deelnemers om een doel te bereiken, en voor de andere helft van de deelnemers hielp creativiteit niet om een doel te bereiken. We voorspelden dat vooral vermijdingsgemotiveerde mensen gestimuleerd zouden worden om in creativiteit te investeren als dit nuttig was en hielp hun doelen te bereiken. We verwachtten dat streefsgemotiveerde mensen altijd relatief creatief zouden zijn, ongeacht het nut ervan, omdat het voor hen relatief makkelijk is om creatief te zijn.

De resultaten van de vijf experimenten lieten zien dat streefsgemotiveerde mensen beter presteerden op creatieve taken dan vermijdingsgemotiveerde mensen als creativiteit niet bijdroeg aan het bereiken van doelen. Als creativiteit wel nuttig was en bijdroeg aan het bereiken van doelen, dan waren streef- en vermijdingsgemotiveerde mensen echter even creatief. Bijvoorbeeld, in Experiment 3.4 vroegen we deelnemers om creatieve inzichtproblemen op te lossen. Als het oplossen van deze problemen niet hielp om een muis dichter bij een stukje kaas te brengen (of eenuil van de muis weg te houden) dan waren deelnemers in de streefconditie creatiever dan deelnemers in de vermijdingsconditie. Echter, als het oplossen van deze problemen de muis wel dichter bij de kaas bracht (of de uil wegde) dan losten deelnemers in de streef- en vermijdingscondities evenveel creatieve inzichtproblemen op. Het lijkt er dus op dat vermijdingsgemotiveerde mensen alleen energie en inspanning investeerden in creatieve prestatie als dit nuttig was bij het bereiken van hun (vermijdings-)doelen.

Bovendien zouden mensen volgens het principe van behoud van energie sneller cognitief overbelast moeten raken door afleidingen die cognitieve bronnen verbruiken wanneer zij vermijdingsgemotiveerd zijn dan wanneer zij streefsgemotiveerd zijn. De resultaten van Experiment 3.4 lieten inderdaad zien dat als mensen vermijdingsgemotiveerd waren, hun creatieve prestatie sterker werd ondermijnd wanneer hun werkgeheugen werd belast (door het onthouden van 5-cijferige nummers tijdens het oplossen van creatieve inzichtproblemen) dan als zij streefsgemotiveerd waren. Ten slotte, als de prestatie van vermijdingsgemotiveerde mensen sterker afhankt van het mobiliseren van cognitieve bronnen en cognitieve controle, dan zou creatieve prestatie uitputtender moeten zijn voor vermijdingsgemotiveerde mensen dan voor streefsgemotiveerde mensen. Zoals verwacht lieten Experimenten 3.2a, 3.2b, en 3.3 zien dat vermijdingsgemotiveerde deelnemers zich meer uitgeput voelden na creatieve prestaties dan streefsgemotiveerde deelnemers.
Samenvatting

Werken onder Tijdsdruk

Uit het principe van behoud van energie vloeit voort dat als cognitieve bronnen worden belast of onbeschikbaar zijn, vermijdingsgemotiveerde mensen minder goed zouden moeten presteren dan streefgemotiveerde mensen. Hoofdstuk 4 testte deze verwachting door mensen onder een lage of een hoge tijdsdruk te laten werken. In vijf experimenten werden de effecten van werken onder tijdsdruk bestudeerd, op taken die goed aansloten en taken die slecht aansloten bij de cognitieve verwerkingsstijl van vermijdingsgemotiveerde mensen. Deze taken omvatten het oplossen van creatieve inzichtproblemen, het oplossen van wiskundige opgaven, en het identificeren van specifieke figuren die afgebeeld werden tussen visueel gelijkende afleidingsfiguren.

Experiment 4.1 was gericht op individuele verschillen in de neiging om vermijdingsdoelen na te streven (i.e., vermijdingstemperament, Elliot & Thrash, 2002; 2010). Hoe meer mensen aangaven over het algemeen vermijdingsdoelen na te streven, hoe sterker hun prestatie op een creatieve inzichttaak werd ondermijnd door werken onder een hoge tijdsdruk. In Experimenten 4.2 en 4.3 werden streef- en vermijdingsmotivatie binnen proefpersonen gemanipuleerd. De deelnemers deden een taak waarbij zij punten konden winnen door het geven van juiste antwoorden op sommige items, en punten konden verliezen door het geven van onjuiste antwoorden op andere items. Deze experimenten lieten een sterker ondermijnend effect zien van werken onder een hoge tijdsdruk bij vermijdingsmotivatie dan bij streefmotivatie, op zowel creatieve als analytische prestatie (i.e., wiskundige opgaven). In Experimenten 4.4 en 4.5 werden ten slotte streef- en vermijdingsmotivatie tussen proefpersonen gemanipuleerd. In Experiment 4.4 werden deelnemers gevraagd om een verhaal te schrijven uit het perspectief van een muis waarin de muis probeert een stuk kaas te bemachtigen, of waarin de muis probeert te vluchten voor een uil. Nadat zij het verhaal hadden geschreven deden de deelnemers een taak waarin aandacht voor details een grote rol speelt. Ze kregen de opdracht om specifieke figuren te vinden tussen visueel gelijkende afleidingsfiguren. Ook prestatie op deze detail gerichte taak leed meer onder tijdsdruk als mensen vermijdingsgemotiveerd waren dan als zij streefgemotiveerd waren.

Dit hoofdstuk liet zien dat prestatie vooral wordt ondermijnd door tijdsdruk wanneer mensen vermijdingsgemotiveerd zijn. Prestatie onder vermijdingsmotivatie is sterker afhankelijk van cognitieve controle en de beschikbaarheid van cognitieve bronnen dan prestatie onder streefmotivatie. We vonden geen aanwijzingen dat stressgerelateerde emoties een rol speelden in het veroorzaken van dit ondermijnende

143
Motivated Creativity

effect, maar vonden aanwijzingen dat het effect werd geproduceerd door een verminderde beschikbaarheid van cognitieve bronnen (Experiment 4.5). Deze resultaten suggererden dat vermijdingsmotivatie fragiel en kostbaar is, en het best zo min mogelijk kan worden gebruikt of aangemoedigd.

**Prestaties Beoordelen: Uitkomsten Versus Processen**

In de hoofdstukken van dit proefschrift die gewijd zijn aan het principe van behoud van energie (Hoofdstukken 2-4), vonden we aanwijzingen dat mensen dezelfde uitkomsten kunnen bereiken wanneer zij vermijdingsgemotiveerd zijn als wanneer zij streefgemotiveerd zijn, op taken die creativiteit, analytisch denken, en aandacht voor details vereisen. Echter, terwijl uitkomsten algemeen geaccepteerd worden als een goede indicator van prestatie op analytische en detail georiënteerde taken, is dit niet onomstotelijk het geval bij creatieve taken. Wanneer mensen creativiteit beoordelen, hebben zij de neiging om niet alleen de uitkomsten, maar ook de processen waaruit de uitkomsten voortkwamen mee te wegen. In Hoofdstuk 5 ontwikkelden we het idee dat hetzelfde creatieve product heel verschillend beoordeeld kan worden afhankelijk van of het tot stand kwam door volharding en systematisch denken (wat vaker voorkomt als mensen vermijdingsgemotiveerd zijn) of door flexibel en associatief denken (wat vaker voorkomt als mensen streefgemotiveerd zijn). We verwachten dat als mensen achteraf kunnen begrijpen hoe een idee of product tot stand is gekomen, zij minder onder de indruk zullen zijn van het idee of product.

Het effect dat mensen achteraf gezien het gevoel hebben dat ze konden voorspellen wat er zou gebeuren (nadat zowel de gebeurtenissen in aanloop naar een specifieke uitkomst, en de uitkomst zelf bekend zijn), wordt treffend het “ik wist het al die tijd” effect genoemd (“I knew it all along”, Fischhoff, 1975; 1977; Hawkins & Hastie, 1990). Hoofdstuk 5 stelt voor dat ideeën die gegenereerd zijn door een flexibele manier van denken of plotselinge inzichten verrassend zijn en ‘uit het niets’ lijken te komen. Wanneer precies dezelfde ideeën op een volhardende en systematische manier worden gegenereerd, is het makkelijker om de gedachtegang van de bedenker te volgen en te begrijpen hoe iemand op een specifiek idee kwam. Dit zorgt er vervolgens voor dat het idee voor de hand liggend, onverrassend, en daarom oncreatief lijkt.

De resultaten van drie experimenten ondersteunden dit “ik heb het altijd al geweten” effect in creativiteitsoordelen. We vroegen bijvoorbeeld deelnemers in Experiment 5.3 om een idee te beoordelen dat door een deelnemer aan een ander experiment was bedacht, tijdens een acht minuten durende individuele
Samenvatting

brainstormsessie over het beschermen van het milieu (Experiment 3.1). Voordat het te beoordelen idee werd getoond, werden de vijf ideeën die voorafgaand aan dit te beoordelen idee waren bedacht één voor één op het computerscherm getoond. Deze ideeën gaven ofwel een flexibele denkwijze weer (i.e., ideeën in veel categorieën, gericht op verschillende milieudoelen), of een systematische denkwijze (i.e., ideeën in weinig categorieën, gericht op dezelfde milieudoelen). De resultaten lieten zien dat mensen het proces waardoor uitkomsten tot stand kwamen meewogen in hun creativiteitsoordelen. Precies dezelfde ideeën werden minder creatief bevonden als deze voortkwamen uit een systematisch proces dan als deze voortkwamen uit een flexibel, associatief proces.

Conclusie

Dit proefschrift ontwikkelde een nieuw principe van behoud van energie om te verklaren hoe streef- en vermijdingsmotivatie prestatie beïnvloeden. Aan de ene kant vonden we dat vermijdingsgemotiveerde mensen kunnen excelleren als zij voldoende worden gestimuleerd om energie en inspanning te investeren. Dit is bijvoorbeeld het geval wanneer het aannemelijk is dat deze investering tot het succesvol voorkomen van falen zal leiden. Zelfs wanneer creativiteit en inzicht vereist zijn, kan zulke stimulatie tot goede prestatie leiden. Meestal worden creativiteit en inzicht geassocieerd met de flexibele en associatieve denkwijze die door streefmotivatie teweeg wordt gebracht. Door energie en cognitieve bronnen te investeren kunnen vermijdingsgemotiveerde mensen echter compenseren voor hun systematische en gecontroleerde denkwijze, en even creatief zijn als streefgemotiveerde mensen.

Aan de andere kant lijkt het erop dat Johan Cruijff op het juiste spoor zat toen hij opmerkte dat het veel makkelijker is om goed te spelen dan om te voorkomen dat je slecht speelt. Hoewel vermijdingsmotivatie effectief kan zijn bij korte projecten doordat cognitieve bronnen en controle worden gemobiliseerd, kan het contraproductief zijn op de lange termijn wanneer energie uitgeput raakt en mensen mentaal vermoeid raken. Zelfs op de korte termijn kunnen negatieve effecten van het streven naar vermijdingsdoelen optreden, omdat het mensen kwetsbaar maakt voor cognitieve overbelasting door afleidingen en stressoren. Dit proefschrift laat zien dat prestatie onder vermijdingsmotivatie effectief kan zijn, maar het is moeilijk, vermoeiend, en wordt makkelijk ondermijnd.
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