Motivated creativity: A conservation of energy approach
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Chapter One

Motivated Creativity: An Introduction
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...
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
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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, Sernulis, & 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 shoot-outs 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
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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
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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,
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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, perseverance 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).
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.