Motivated creativity: A conservation of energy approach
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Citation for published version (APA):
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
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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
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. Externally 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 fear 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).
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
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
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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.