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

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: http://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
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, Perrewe, & Zellars, 2002).
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 (Fürster, 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, \(\beta = -.30, p = .005\), and working under high time pressure were related to
worse RAT performance, $\beta = -.36, p = .001$. In addition, the interaction of avoidance temperament and time pressure predicted performance on the moderately difficult RAT items, $B = -.53, p = .036$. 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, $B = -.25, p = .33$. 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. Percentage of correctly solved moderately difficult RAT items (+SE) in Experiment 4.2.
Avoidance Motivation, Performance, and Time Pressure

Experiment 4.3

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, $M_{age} = 21.86$, $SD = 4.89$) 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.](image)
Experiment 4.4

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, $M_{age} = 19.75$, SD = 1.40) were randomly assigned to the conditions of a 2 (time pressure: low vs. high) x 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 $2 \times 2$ (time pressure: low vs. high) x (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 $2 \times 2$ (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 $2 \times 2$ (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 ($M = 2.83, SD = 1.10$ vs. $M = 3.55, SD = 1.28$), $F(1,75) = 6.95, p = .010$, 4

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.
Avoidance Motivation, Performance, and Time Pressure

η² = .09, and less quiescence (M = 2.95, SD = 1.49 vs. M = 4.05, SD = 1.87), F(1,75) = 8.26, p = .005, η² = .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.

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**

*Manipulation 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, nor 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](image)

**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
A 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
are conducive to avoidance motivation. 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.