Creativity under the gun
How threat features and personal characteristics motivate creative responding
Cheng, Y.

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CHAPTER 4

Threat Direction and Time Pressure Affect Creative Threat-Responding
In a world characterized by crises and competition, people are often confronted with threats to one’s property, relationships, and well-being (Marks & Nesse, 1994; Staw, Sandelands, & Dutton, 1981). To successfully escape or neutralize these threats, people sometimes employ quite creative strategies that are both novel and appropriate (Runco, 2004). For example, in warfare, strategists generate deceptive strategies that mislead their opponents, to combat life-threatening infections, medical scientists invent new treatments, and to protect against terrorist attacks, security agents think of innovative screening methods.

These examples notwithstanding, the effects of threat on creativity remain poorly understood. Whereas threats, and concomitant fear and anxiety, are typically associated with reduced creativity (Byron & Khazanchi, 2011; Mehta & Zhu, 2009), other work suggests that people are highly motivated to avoid, and cope with, threats and selectively focus their attention on relevant information that is available in the environment and stored in memory (Elliot, 2008). These motivational and cognitive processes, in turn, lead to a greater number of (original) ideas that, crucially, pertain especially to threat-relevant domains (the Motivated Focus Account; De Dreu & Nijstad, 2008). For instance, people anticipating a hostile negotiation generated more original competitive negotiation tactics than those anticipating a cooperative negotiation, but their creative performance in non-conflict domains was reduced (De Dreu & Nijstad, 2008). An accumulating body of studies supports this threat-relevant creativity effect in response to a range of threats, including conflict (De Dreu & Nijstad, 2008), the potential loss of monetary resources (Roskes, De Dreu, & Nijstad, 2012), and hostile interpersonal and animal encounters (Cheng, Baas, & De Dreu, 2016b).

Without exception, the aforementioned studies assessed creativity using open-ended assessments: Research participants are given ample time to come up with as many ideas as possible, for example, to settle negotiations (De Dreu & Nijstad, 2008) or to deal with possible threats (Cheng et al., 2016b). Although valid and useful, ecological validity is putatively low. When confronted with threats, people typically have limited time to come up with, and select, a single fitting response. Our first goal here was to uncover whether and when threats associate with creativity if threat-responding is urgent. One important factor determining the urgency of a threatening situation is whether the threat is self-directed or other-directed. Whether a threat is directed toward or away from the observer is a critical factor that modulates the evaluation of a threatening situation because
the direction signals whether the observer is the target of the threat. Compared to other-directed threats, self-directed threats are perceived as more imminent and harmful to participants themselves (Flykt, Esteves, & Öhman, 2007; Kveraga et al., 2015), and thus evoke greater avoidance motivation. Because the strength of avoidance motivation determines the level of threat-relevant creativity (Baas, De Dreu, & Nijstad, 2011; De Dreu & Nijstad, 2008), we propose that compared to other-directed threats, self-directed threats would lead to a greater number of original threat responses (Hypothesis 1).

Threat urgency is also determined by the time available to respond. The experience of time pressure due to limited time and the requirement to respond fast interferes with, and prohibits, effortful and extensive processing, which generally leads to reduced creativity (Andrews & Smith, 1996; Braunstein-bercovitz, 2003; Chu & Spires, 2001). Meanwhile, immediate responses are often habitual and highly accessible; people need some time to arrive at more original responses (Beaty & Silvia, 2012; Finke, Ward, & Smith, 1992; Nijstad, De Dreu, Rietzschel, & Baas, 2010). Given that time pressure interferes with effortful thinking and achieving creativity often takes time, we expected a main effect of time pressure with a lower amount of original responses generated by people under high as compared to low time pressure (Hypothesis 2). Finally, dealing with time pressure consumes cognitive resources that would otherwise be available for the execution of the task (Karau & Kelly, 1992), and performance under avoidance motivation relies heavily on the recruitment and availability of cognitive resources and control (Koch, Holland, & van Knippenberg, 2008; Roskes et al., 2012; Ståhl, Van Laar, & Ellemers, 2012). Indeed, when people experience relatively stronger avoidance motivation, people’s creative performance is enhanced only when time pressure is low rather than high (Nijstad et al., 2010; Roskes, Elliot, Nijstad, & De Dreu, 2013). Accordingly, we predicted an interaction effect between time pressure and threat direction on the number of original responses to threats, such that when threats are self-directed (i.e. avoidance motivation is strong), participants with more response time (i.e. low time pressure) will generate more original responses than those with little response time (i.e. high time pressure), but with little effects of time pressure when threats are other-directed (Hypothesis 3).

A second goal of the current study was to uncover for whom urgent threats associate with creativity. Because the strength of avoidance motivation is key in driving threat-relevant creativity, we considered the role of individual differences in threat sensitivity and avoidance motivation. One way to capture people’s dispositional avoidance
tendency is by measuring their avoidance temperament – people’s sensitivity for the presence and prospect of negative stimuli (Elliot & Thrash, 2010). People high in avoidance temperament are more vigilant to danger in the environment and are more aroused and anxious in response to threats (Carver & White, 1994; Elliot & Thrash, 2010). It is thus possible that such people will perceive self-directed threats as particularly imminent, and will be strongly motivated to invest cognitive resources in coming up with responses to deal with the threats, and ultimately generate more creative responses to solve the problem at hand. Accordingly, we predicted that self-directed threats would lead to more original defense responses than other-directed threats especially for people higher in avoidance temperament (Hypothesis 4a). Moreover, since earlier work showed that especially for people high in avoidance temperament, low rather than high time pressure promotes performance (Roskes et al., 2013), we expected that low rather than high time pressure would enhance the number of original threat responses especially for people higher in avoidance motivation (Hypothesis 4b).

Method

Design and participants. On the basis of earlier work (Cheng et al., 2016b; Roskes et al., 2012), we expected to obtain small to medium effect sizes. Using the G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007), we calculated that to obtain a small to medium effect ($\eta^2_p = .025$) would require 309 participants (at power = .80, $\alpha = .05$). We recruited 328 participants (73% female, $M_{age} = 21.97, SD = 3.01$) in two waves of data collection (October 2014 and March 2015). Participants received €5 or course credit and were randomly assigned to conditions of a 2(time pressure: low vs. high) × 2(threat direction: self-directed vs. other-directed) between-subjects design. Avoidance temperament constituted a third, independent and continuous variable. Dependent variables were manipulation checks and the originality of creative defense responses participants generated. The study had ethics approval, and participants signed informed consent and were debriefed upon completion of the study. We report all measures, manipulations, and exclusions in the study.

Procedure and manipulation. After participants were seated in individual cubicles equipped with a computer that displayed all instructions and registered all responses. Participants completed the Avoidance Temperament Questionnaire (Elliot & Thrash, 2010) and, thereafter, performed an idea generation task. Participants were instructed that they would see a series of pictures depicting threatening situations and for each situation, they
were asked to think about and type in what they would do when they would be confronted with the threatening situation shown in the picture in real life (see Figure 4.1). Depending on threat-direction condition, pictures depicted threats directed at the viewer (self-directed threat; e.g., a man points a gun in the direction of the participant), or threats not directed at the viewer (other-directed threat; e.g., a man points a gun, but not in the direction of the participant). In total, participants completed 14 trials, with each trial containing a different picture and with pictures presented in random order. The main subjects in the pictures were aggressive animals (e.g., shark, snake, or leopard) or aggressive humans with weapons (e.g., human with gun, stick, or knife). The stimulus pictures in self-directed and other-directed threat conditions were matched on content. Those pictures were selected from Kveraga et al. (2015) and supplemented with stimuli from the Internet that have been pilot-tested\(^2\).

In addition to manipulating the direction of the threat, we manipulated time pressure. Half of the participants were asked to generate and enter their response within 12 seconds (high time pressure); the other half were also asked to generate and enter their response, but first had a “thinking period” of 10 seconds during which they could not type in their answer; following this 10s period they had another 12 seconds to enter their response (low time pressure). In both conditions, the time available for generating and typing was indicated by a timer. Following this task, participants answered some questions about perceived time pressure and their feelings regarding the pictures.

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\(^2\) Results of the pilot study revealed that self-directed and other-directed threats did not induce different feeling of threat, \(t(52) = 0.65, p = .518\) (\(M_{self-directed} = 5.43, SD_{self-directed} = 1.08\); \(M_{other-directed} = 5.40, SD_{other-directed} = 1.13\)), but elicited different perceptions of self-relevance, \(t(52) = 6.10, p < .001\), with stronger personal relevance reported in the self-directed (\(M = 4.55, SD = 1.48\)) rather than other-directed threat condition (\(M = 3.63, SD = 1.52\)).
Figure 4.1. Schematic illustration of a trial in the creative defense response task in the high time-pressure condition (Panel A) and low time-pressure condition (Panel B). In the high time-pressure condition, a trial started with the presentation of a picture depicting either self-directed threats or other-directed threats. Participants were asked to think about one response to the depicted situation and press “Enter” when they figured out their solution. Hereafter, they typed in their response in the given box and pressed “Enter” when they finished typing. The trial ended after the response was registered or 12 seconds had elapsed since the onset of the trial. In the low time-pressure condition, participants first saw the picture and question for 10 seconds in which they could not enter their response. After that, the trial was identical to the one in the high time-pressure condition.

**Dependent variables.** We assessed the extent to which participants perceived the pictures as threatening (“I found the pictures threatening”, “I found the pictures negative”, and “I found the pictures unpleasant”, Cronbach’s $\alpha = .77$) and arousing (“I felt vigilant
while looking at the pictures”, and “I felt alert while looking at the pictures”, Cronbach’s $\alpha = .86$), and on two single items whether the situations depicted in the pictures were personally relevant and directed at participants on a 7-point scale (1 = strongly disagree, to 7 = strongly agree). In addition, participants indicated whether they experienced time pressure and whether they had plenty of time to come up with a response (reverse scored) on a 1 (strongly disagree) to 7 (strongly agree) scale (Cronbach’s $\alpha = .73$).

From the responses participants entered, we obtained a score for originality – the number of infrequent responses. The originality index was computed by counting the number of infrequent ideas a participant generated (Runco & Albert, 1985; Torrance, 1966). First, to each response, we assigned a frequency score derived from an independent larger database (5,071 responses that were generated by 305 participants) derived from previous studies in which participants generated as many tactics as possible to deal with possible threats while the same stimulus pictures emerged on the screen as in the current study (Cheng et al., 2016b). Specifically, to each response generated in the current study, we assigned the frequency score the exact same response received in the larger database. For example, the response “call for help” was mentioned by 46% of participants in our previous studies, and so this answer received the frequency score of 46 in the current study. On the basis of the frequency scores, we assigned originality scores to generated ideas in a second procedure. Responses were considered original and received a score of 1 if they received a frequency score of less than 5 (i.e. they were mentioned by less than 5 percent of the sample in previous studies); responses were considered unoriginal and received a score of 0 if they received a frequency score of 5 and higher (Baas et al., 2011; Torrance, 1966). In the current study, 97% of the responses generated by the participants could be matched with responses from the existing database. The remaining responses were first checked by content; all were considered original and received a score of 1. We then summed the number of original tactics per participant generated as an index of originality.

**Avoidance Temperament.** Individual differences in avoidance temperament were measured with the six-item avoidance temperament subscale of the approach-avoidance temperament questionnaire (Elliot & Thrash, 2010). Sample items include: “I react very strongly to bad experiences”, and “It’s easy for me to imagine bad things that might happen to me”. Participants rated on a 7-point scale (1 = strongly disagree, to 7 = strongly agree) how much they agreed with the statements (Cronbach’s $\alpha = .82$). Higher scores reflect
stronger avoidance temperament.

**Results**

*Manipulation check.* To verify the effectiveness of the manipulation, we submitted ratings for the perceived threat, arousal, self-relevance, and the extent to which the focal objects in the pictures were perceived as being directed to themselves to separate ANOVAs with time pressure and threat direction as between-subjects variables. Although threat direction did not influence the experience of threat, \(F(1, 324) = 1.60, p = .206\), threat direction did affect arousal, \(F(1, 324) = 8.83, p = .003, \eta^2_p = .03\). Participants in the self-directed threat condition felt more vigilant and alert (\(M = 5.20, SD = 1.31\)) than those in the other-directed threat condition (\(M = 4.76, SD = 1.39\)). Moreover, we obtained a main effect of threat direction on personal relevance ratings, \(F(1, 324) = 5.55, p = .019, \eta^2_p = .02\), with stronger personal relevance reported in the self-directed (\(M = 3.80, SD = 1.82\)) rather than other-directed threat condition (\(M = 3.34, SD = 1.72\)). For the extent to which threats in the pictures were perceived as being directed to themselves, we also found a main effect of threat direction, \(F(1, 324) = 356.87, p < .001, \eta^2_p = .52\). Participants in the self-directed threat condition reported the threats in the pictures to be more directed to themselves (\(M = 5.94, SD = 1.26\)) than those in the other-directed threat (\(M = 3.02, SD = 1.52\)). No main effect of time pressure, \(Fs < 0.71, p > .400\), or interaction effect, \(Fs < 0.72, p > .400\) was found. Thus although the level of threat was the same for both conditions, self-directed threats were perceived as more self-directed, arousing, and personally relevant, than other-directed threats.

When looking at perceived time pressure, the ANOVA with time pressure and threat-direction as between-subjects variables revealed that participants in the high time pressure condition experienced more time pressure (\(M = 5.56, SD = 1.36\)) than those in the low time pressure condition (\(M = 4.22, SD = 1.79\)), \(F(1, 324) = 57.95, p < .001, \eta^2_p = .15\). No other effects were found, \(Fs < 1.61, ps > .20\). Accordingly, we conclude that threat direction and time pressure were manipulated as intended.

*Preliminary analyses.* Although participants were supposed to generate one response to each picture and thus 14 responses in total, time pressure may have affected the ability to meet this (informal) requirement. A \(2^{\text{(time pressure: high vs. low)}} \times 2^{\text{(threat direction: self-directed vs. other-directed threat)}}\) between-subjects factorial ANOVA showed no effects involving direction of threat, \(Fs < 0.94, ps > .335\), but did show a main effect of time
pressure, \( F(1, 324) = 19.71, p < .001, \, \eta^2_p = .06 \). More responses were finished under low (\( M = 13.63, SD = 0.65 \)) than high time pressure (\( M = 13.04, SD = 1.55 \)). Because the total number of responses also correlated with originality (\( r = .15, p = .007 \)), the total number of responses was included as a control variable in subsequent analyses.

**Originality.** To test our hypotheses, a hierarchical moderated regression analysis was performed with the number of original responses as the dependent variable. In the first step, the total number of generated responses was entered as a control variable. In the second step, dummy-coded time pressure condition (1 = high, 0 = low), the dummy-coded direction of threat (1 = self-directed, 0 = other-directed), and mean-centered avoidance temperament were entered. Subsequently, in the third step, we added the two-way interaction terms of threat direction with time pressure, threat direction with avoidance temperament, and time pressure with avoidance temperament. In the final step, and for exploratory purposes, the threat direction \( \times \) time pressure \( \times \) avoidance temperament interaction term was added. Table 4.1 shows the results of the hierarchical analysis.
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*Note: Dependent variable = the number of original responses. *$p < .05$; **$p < .01$.}
Results showed that first, the number of generated responses positively related to the number of original responses, $\beta = .15$, $t(326) = 2.74$, $p = .007$, 95%CI = 0.08, 0.46. Second, in line with Hypothesis 1, the main effect of threat direction was significant, $\beta = .13$, $t(323) = 2.39$, $p = .017$, 95%CI = 0.10, 1.03, indicating that self-directed threat led to more original responses ($M = 3.48$, $SD = 2.35$) than other-directed threat ($M = 2.91$, $SD = 2.00$). As expected, the main effect of time pressure was also significant, $\beta=-.17$, $t(323) = -3.14$, $p = .002$, 95%CI = -1.24, -0.29, with more original responses generated under low time pressure ($M = 3.64$, $SD = 2.28$) than under high time pressure ($M = 2.77$, $SD = 2.03$; supporting Hypothesis 2). There was no significant effect of individual differences in avoidance temperament on originality, $\beta = -.01$, $t(323) = -0.21$, $p = .835$, 95%CI = -0.22, 0.18.

Adding the two-way interaction terms in the third step of the regression analysis significantly improved the regression model ($\Delta R^2 = .03$, $F(3, 320) = 3.18$, $p = .024$). Although the predicted interaction between time pressure and threat direction, $\beta = .04$, $t(320) = 0.82$, $p = .411$, 95%CI = -0.54, 1.31, and between time pressure and avoidance temperament, $\beta = -.08$, $t(320) = -1.46$, $p = .146$, 95%CI = -0.69, 0.10, was not significant (disconfirming Hypothesis 4b), the threat direction $\times$ avoidance temperament interaction was: $\beta = .14$, $t(320) = 2.67$, $p = .008$, 95%CI = 0.14, 0.93. Simple slope analysis (SPSS PROCESS macro; Hayes, 2013) showed that self-directed threats elicited more original responses than other-directed threats for participants high in avoidance temperament (+1 SD), $B = 1.16$, $t (323) = 3.42$, $p = .001$, 95%CI = 0.49, 1.83, but not for those low in avoidance temperament (-1 SD), $B = -0.02$, $t (323) = -0.05$, $p = .961$, 95%CI = -0.68, 0.65 (see Figure 4.2; supporting Hypothesis 4a). Finally, there was no significant three-way interaction on the number of original responses, $\beta= .03$, $t(319) = 0.56$, $p = .574$, 95%CI = -0.57, 1.02.
Figure 4.2. Interaction effect with 95% confidence intervals (grey areas) between avoidance temperament and threat direction predicting the number of original responses.

The two main effects of threat direction and time pressure may indicate that these two facets of threat urgency determine the number of original threat responses in an additive fashion. We further inspected this possibility by submitting the number of original responses to a four-level (other-directed threat with high time pressure, self-directed threat with high time pressure, other-directed threat with low time pressure, and self-directed threat with low time pressure) one-way ANCOVA with the total number of responses as a covariate. There was a significant effect of condition on originality, \(F(3, 323) = 5.37, p = .001, \ \eta^2_p = .05\). A Difference planned contrast comparing the originality scores in the self-directed threat/low time pressure condition to the averaged originality scores in the other three conditions was significant, \(p = .005\). Participants facing self-directed threats with low time pressure generated more original responses (\(M = 3.83, SD = 2.53\)) than those in the other three conditions combined (\(M_{other-direct threat; high time pressure} = 2.39, SD = 1.87\), \(M_{self-direct threat; high time pressure} = 3.14, SD = 2.12\); \(M_{other-direct threat; low time pressure} = 3.46, SD = 1.99\)). Moreover, the Helmert planned contrast comparing the condition of indirect threat with high time pressure with the other three conditions revealed a significant difference, \(p < .001\). Participants facing other-directed threats under high time pressure generated less original responses than those in the other three conditions combined.
Discussion

When given ample time to consider many possible solutions, threat exposure has been shown to lead to a focused use of cognitive resources to deal with the threat at hand, resulting in original threat-relevant ideation (Cheng et al., 2016b; De Dreu & Nijstad, 2008). However, threats in real life often require an urgent, single response. Therefore, the primary goal of the current study was to uncover whether and when threats associate with creativity if threat-responding is urgent. Specifically, we examined the effects of two situational factors that are highly relevant in urgent threatening circumstances – time pressure and whether threats are directed to oneself or another – on the generation of creative defense responses. Additionally, we examined for whom urgent threats associate with threat-relevant creativity and here we considered individual differences in sensitivity to negative stimuli (i.e. avoidance temperament). Our results show that people under threats generated more original responses when threats were self-directed rather than other-directed, and this effect was more pronounced for those high in avoidance temperament. Moreover, creative responses were significantly reduced when people experienced high time pressure to respond to threats, and people generated the largest number of original responses when threat was self-directed and time pressure was low.

Theoretical and Practical Implications

Current study findings both support and extend the motivated focus account of threat-relevant creativity (De Dreu & Nijstad, 2008). According to this account, threatened people are highly motivated to focus their attention and devote their cognitive resources to manage the threat, which results in the generation of original solutions to deal with the threat at hand, but not in other domains. In line with this proposition, current results show that more self-relevant and arousing threats (i.e. threats that were self-directed) led to more creative responses than less relevant threats (i.e. threats that were other-directed) and this effect was more pronounced in people that are dispositionally inclined to respond strongly to harmful situations. These findings underscore the importance of avoidance motivation in driving threat-relevant creativity. More importantly, we extend the motivated focus account by generalizing this threat-relevant creativity effect to a more realistic setting that calls for urgent threat responding. Our findings show that even when people could only generate a single response to deal with a presented threat, their response was more likely to be creative when the threat at hand was self-directed and more personally relevant.
When time is limited and fast responding is required, threatened people may experience time pressure. In the current study we therefore additionally considered the role of time pressure. We have argued that high time pressure interferes with effortful processing and limits attentional resources and the time needed to retrieve more original responses. Indeed, our findings show high time pressure is detrimental to creative performance under threats. People are sometimes confronted with situations that pose immediate threats to their health, security, or possessions, which requires urgent responding. As such, the current study provides some practical implications. Notably, in our study, the low time pressure group had only 10 seconds more than the high time pressure group to come up with a fitting threat response. Our findings thus imply that when dealing with immediate threats, taking a little more time can improve the originality of threat-responding. This has great adaptive value because original threat-responding helps to prevent the attacker from predicting the defense response of the victim, thereby increasing the likelihood of survival (Eilam, Izhar, & Mort, 2011; Humphries & Driver, 1967).

On the basis of earlier findings, we also predicted that taking more time to think would especially benefit the creativity of people with stronger avoidance motivation, i.e. those facing threats directed at themselves or scoring high on avoidance temperament (cf. Roskes et al., 2013). Although the interaction effects between avoidance temperament and time pressure and between time pressure and threat direction were not significant, we found an additive effect of time pressure and threat direction on creative responses, revealing the largest number of original responses in people facing self-directed threats with low time pressure, and the least number of original responses in people facing other-directed threats with high time pressure. Although this result should be interpreted cautiously, it may suggest that original threat responding is determined by the level of motivation to avoid or resolve the threat, on the one hand, and the ability (cognitive or situational resources, including time available to think and respond) to engage in effortful processing, on the other.

The current study also provides a methodological implication. Research about threat-related creativity benefits from approximating real-world situations. However, previous work either focused on idea generation where people had sufficient time to generate as many ideas as possible (Cheng et al., 2016b; De Dreu & Nijstad, 2008; Roskes et al., 2012), or on idea evaluation where people rated how creative someone else's idea was
without time constraints and with the idea having nothing to do with the negative state people were in (Mueller, Melwani, & Goncalo, 2012). However, in many real-life threatening situations, such as unexpected violent assaults, medical emergencies, or sudden car accidents, people have to come up with a single, urgent response they generate themselves. In those situations, people deal with both the threat at hand and a small time window to respond. With the current design in which participants had little time to give only one response to each specific threat, we raised the ecological validity of our findings. In addition, this design allowed us to test the main and interaction effects of threat and time pressure on creative threat responses.

Limitations and Avenues for Future Research

Although the current study uncovered whether, when, and for whom threats associate with original responses if threat-responding is urgent, it is important to note that a truly creative idea needs to be both original and useful/effective. Especially in a threatening situation, it is important to generate and select a truly creative idea rather than an unusual but useless idea. Previous studies showed that in negative circumstances people are usually biased against originality in favor of usefulness (Mueller et al., 2012). However, this may be particularly the case when people consider products or ideas that have nothing to do with the negative situation at hand. Our results show that under self-directed threats, people generate and respond with an original way to cope with that threat. It would be interesting for future research to see under what circumstances people are able to generate and spot the threat responses that are both original and useful.

Conclusion

In sum, the current study took the first step to examine creative threat-responding in a more realistic setting where an urgent and single response was required. It shows that threatened people generate more creative responses when facing self-directed rather than other-directed threats, especially in those that are highly sensitive to harmful stimuli. Even though urgent threat responses are important to deal with the threat at hand, our findings also show that taking a bit more time to think increases the number of original threat responses. Together, these results suggest that the creativity of threat responses depends on people's motivation to avoid the threats and resources to process threat-relevant information.