Shoot or don’t shoot? Why police officers are more inclined to shoot when they are anxious

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Abstract

We investigated the effect of anxiety on police officers’ shooting decisions. 36 police officers participated and executed a low- and high-anxiety video-based test that required them to shoot or not shoot at rapidly appearing suspects that either had a gun and ‘shot’, or had no gun and ‘surrendered’. Anxiety was manipulated by turning on (high-anxiety) or turning off (low-anxiety) a so-called ‘shootback canon’ that could fire small plastic bullets at the participants. When performing under anxiety, police officers showed a response bias towards shooting, implying that they accidentally shot more often at suspects that surrendered. Furthermore, shot accuracy was lower under anxiety and officers responded faster when suspects had a gun. Finally, since gaze behavior appeared to be unaffected by anxiety, it is concluded that when they were anxious, officers were more inclined to respond on the basis of threat-related inferences and expectations rather than objective, task-relevant visual information.

Keywords: anxiety, attentional bias, attentional control, decision making, perceptual-motor performance, police.
Shoot or don’t shoot? Why police officers are more inclined to shoot when they are anxious

Anxiety is known to be of great influence on our cognitive and perceptual-motor performance. While most people will only experience anxiety occasionally, there are several professions in which the experience of extreme pressure and anxiety is an inevitable part of the job. For instance, think about fire-fighters trying to rescue someone from a burning house, a surgeon executing a life-saving operation, a soccer-player taking a decisive penalty during a world-championship final, or a police officer ending up in a shoot-out with a dangerous criminal. In situations like these the pressure to perform well is at a peak, and it is of the utmost importance that people make the right decisions.

In the current study we show that anxiety, caused by the apprehension of being hit with plastic bullets, negatively influences police officers’ shooting decisions. We provide evidence that one of the key mechanisms underlying this effect, may be that attentional control is diminished under anxiety, causing officers to respond on the basis of threat-related inferences and expectations rather than objective, task-relevant visual information.

In general, it is well established that one of the main consequences of anxiety is that the attentional system gets biased in favor of threat-related stimuli (Bar-Haim et al., 2007). This attentional bias is believed to arise as a result of competition between stimulus-driven (bottom-up) and goal-directed (top-down) attentional control mechanisms. Under anxiety, the influence of the stimulus-driven system is increased, resulting in more attention to possible threats. At the same time, the influence of the goal-directed system is diminished, and more effort is needed to inhibit distraction and actively direct attention towards task-relevant information (Eysenck et al., 2007).

Supporting this line of thought, recent work with police officers showed that under anxiety, police officers shoot faster, alter their visual orientation, and are more easily distracted by task-irrelevant, threat-related visual information (i.e., increased stimulus-driven behavior; Nieuwenhuys & Oudejans, 2010, 2011). Furthermore, officers executed significantly shorter goal-directed fixations, which allowed less time to fine-tune movements on the basis of task-relevant visual information, and caused a considerable decrease in shot accuracy (Nieuwenhuys & Oudejans, 2011; cf. Wilson, Vine et al., 2009; Vickers & Williams, 2007).
B. Threat-related interpretation

While these results concern the effects of anxiety on basic skill execution (e.g., shooting at predefined target areas), anxiety may also affect decision making (e.g., shoot or don’t shoot). In this respect, one could argue that if anxiety causes individuals to show more and stronger attention to threat, it may also cause them to show quicker judgments and decisions in response to threat. In fact, this is exactly what is shown in weapon identification tasks, where participants appear to be faster in correctly identifying weapons on trials depicting negatively stereotyped, more ‘threatening’, suspects (e.g., black males) compared with trials depicting suspects that are not negatively stereotyped and, hence, less threatening (e.g., white males; Correll et al., 2002; Fleming, Bandy, & Kimble, 2010; Payne, 2001). Unfortunately, faster judgments also tend to cause more false positive errors. That is, anxious officers appear more likely to also “recognize” weapons on trials where, in fact, there was none (e.g., Fleming et al., 2010).

With respect to top-down and bottom-up control (e.g., Bar-Haim et al., 2007; Eysenck et al., 2007), the fact that anxious individuals respond faster to threat and make more false positive errors, can be explained either on the basis of attentional processes or on the basis of interpretational processes (Bishop, 2007). Regarding (visual) attention, increased anxiety has been related to agitated scan behavior (e.g., Nieuwenhuys & Oudejans, 2011; Wilson, Vine et al., 2009), quicker detection of threat (e.g., Amir et al., 2003), and more difficulty in disengaging from threat (Fox et al., 2001). Consequently, anxiety may cause people to miss task-relevant information, or visually concentrate on selective (threat-related) information, thereby leading to changes in decision making and action. Alternatively, with perceptual input remaining equal, anxiety may also bias threat-related interpretations (Blanchette & Richards, 2010; Bishop, 2007). For instance, when individuals listen to a voice recording and are asked whether they heard the word ‘die’ or ‘dye’, anxiety increases the chance of hearing ‘die’ (e.g., Calvo & Castillo, 2001). According to Blanchette and Richards (2010), anxious individuals perceive negative events as more likely to occur and, hence, are quicker to interpret perceived stimuli in a threat-related manner.

One way or another, if it is true that anxiety causes individuals to be quicker in making emotion-congruent (threat-related) decisions, and if this leads to increases in false-positive errors, that could have negative consequences for police officers, for whom the experience of severe pressure and anxiety is an inevitable part of their job. Although there have been some studies that investigated police officers’ shooting
decisions (e.g., Correll et al., 2002; Fleming et al., 2010; Payne, 2001), a vast majority used computer-based weapon identification tasks and, as such, did not involve the ‘actual act of shooting’ (see Payne, 2006, for a review of this literature). Furthermore, in most studies, time pressure and stereotype threat were manipulated, leaving the anxiety that results from the possibility of getting hit, unaccounted for. In the current experiment, in which we used a video-based simulation environment, we therefore asked police officers to shoot or not shoot at rapidly appearing suspects that either had a gun and ‘shot’, or had no gun and ‘surrendered’. We manipulated anxiety by turning on (high anxiety) or turning off (low anxiety) a so-called ‘shootback canon’ that could fire with small plastic bullets. We analyzed the officers’ decision making on the basis of their actual shooting responses (i.e., shoot or don’t shoot), and measured gaze behavior to estimate the extent to which anxiety-induced changes in visual attention may contribute to the observed effects.

In general, we expected that anxiety would bias officers towards shooting and cause them to respond faster to threat. That is, under anxiety, we predicted officers to be quicker, and decide to shoot more often at suspects that surrendered (e.g., Correll et al., 2002; Fleming et al., 2010; Payne, 2001; see also Payne, 2006). We reasoned that if this effect is due to anxiety-induced changes in visual attention, this should be reflected in more agitated scan behavior (i.e., higher scan ratio; Nieuwenhuys & Oudejans, in press), earlier detection of the suspect (e.g., Amir et al., 2003), and difficulty to disengage visual attention from the suspect (e.g., Fox et al., 2001). On the other hand, if officers decide to shoot more often because they have an increased expectancy of threat, and stronger threat-related interpretations under anxiety (e.g., Calvo & Castillo, 2001; see also Blanchette & Richards, 2010), this should not be reflected in gaze behavior but primarily affect their response times. Finally, with respect to shot execution, we predicted that anxiety would lead to faster responses and shorter fixations on the suspect, thereby causing a decrease in shot accuracy (Nieuwenhuys & Oudejans, 2010, 2011).

Methods

The experiment was approved by the Ethics Committee of the research institute. Given the involvement of firearms, the experiment was executed under responsibility of certified police firearms instructors.
B. Threat-related interpretation

Participants
36 Experienced police officers (33 men, 3 women), with a mean age of 37.79 years and a mean working experience of 14.92 years volunteered to participate. All participants had a full license to carry a firearm on duty. Participants’ trait anxiety scores were significantly lower than the norm (i.e., 36.1; with M = 30.21, SD = 6.08, t(28) = 5.22, p < .001; STAI A-Trait Scale; Van der Ploeg et al., 1980), suggesting that they had no extraordinary tendency to respond to specific situations with elevations in state anxiety. Before the experiment started, all participants provided written informed consent.

Apparatus
The experiment made use of an Applied Interactive Systems (AIS) PRISim® video simulation environment (AIS-solutions Ltd., Wrecclesham, United Kingdom). Using the ‘AIS’, participants were allowed to interact with life-size video scenarios that were specifically prepared for the experiment and digitally projected on a 6.0 × 2.5 meter screen. Participants stood at a fixed position 5 m from the screen and shot with a blank firing Walther P5 handgun (similar to their duty weapon) that was fitted with a trigger sensor and a laser diode that emitted a single laser pulse (5 ms) upon firing. This laser pulse was detected by an infrared, hardware-based timing mechanism (60 Hz sampling rate) that was used to record the timing (± 12 ms) and accuracy (± 2 cm) with which the gun was fired at pre-defined hit zones in the scenarios. To measure their gaze behavior, participants wore a mobile eye tracker (Applied Science Laboratories, Bedford, USA). The ‘mobile eye’ is a monocular corneal-reflex system that consists of two cameras, an eye camera and a scene camera (29.97 Hz), which are mounted on a pair of sports glasses. Based on the combined images of both cameras, direct line of gaze is calculated with an accuracy of 3° of the visual angle.

Task
The experiment consisted of a low-anxiety (LA) and a high-anxiety (HA) condition, which were counterbalanced among participants. In each condition, participants performed 48 trials in which they were asked to respond to a suspect who rapidly appeared from behind one of two windows (i.e., left or right; see Figure 5.1). If the suspect appeared with a gun (i.e., GUN scenario, Figure 5.1a) participants were supposed to shoot him as fast and accurately as possible. Whenever participants
responded too late (i.e., used more than ~ 500 ms for their response) or responded inaccurately (i.e., missed), the suspect would shoot back. If the suspect appeared without a gun (i.e., NO-GUN scenario, Figure 5.1b) participants were supposed not to shoot the suspect but, instead, place a shot in a black taped square (40 cm × 40 cm) that was positioned well below the two windows in the middle of the screen. In this way, a response time could be obtained for proper recognition of the NO-GUN scenario. Participants were allowed only one shot per trial.

To make sure that participants could not predict the onset of the suspect’s appearance, three different lead-up durations (1s, 1.5s, 2s) — showing only the two empty windows — were used and randomized over trials. Whenever participants successfully shot the suspect in the GUN scenario, the suspect would fall down. When participants accidentally shot the suspect in the NO-GUN scenario, the screen would turn red. In other cases (e.g., missing the suspect in the GUN scenario or responding correctly to the NO-GUN scenario) the suspect would remain standing. In total, each trial lasted around five seconds. Between trials the screen went black for three seconds. In both conditions (LA and HA), trials were collapsed in four subsets of twelve, with a two-minute break between subsets to allow participants to rest.

Figure 5.1: Screen shot showing the suspect in the GUN (a) and NO-GUN (b) scenario. In each scenario (GUN or NO-GUN) the suspect could appear in the left as well as in the right window.
Conditions
In the GUN scenario, the suspect would shoot whenever participants responded too late (i.e., used more than ~ 500 ms for their response) or did not respond accurately (i.e., missed). In the LA condition, only audio feedback was provided from the suspect’s shots, thereby making this condition a relatively harmless experience. In the HA condition, however, a so-called ‘shootback’ canon (AIS-solutions Ltd., Wrecclesham, United Kingdom) was activated. The shootback canon is a manually aimed air-pressure system that was positioned at the bottom-right corner of the projection screen, linked to the AIS, and loaded with small plastic bullets (15 mm diameter) that were shot in the direction of the participants’ legs at the exact moment of the suspect’s shots. Being hit with such a bullet caused a sensation of pain, the threat of which was expected to cause an increase in participants’ state anxiety. Given the speed of the scenarios, the suspect was faster than participants on ~ 50% of the GUN trials (M = 49.72, SD = 12.95), thereby providing enough opportunity to shoot back with the shootback canon. However, to maintain threat and minimize physical inconvenience, each participant was hit on a limited number of HA GUN trials (i.e., 5–7 times in total, randomly divided over trials; cf. Nieuwenhuys & Oudejans, 2010, 2011). On other trials the shootback canon was aimed slightly off target, thereby preventing the participants from being hit.

Dependent variables
Manipulation check. To analyze the effect of our manipulation, we assessed participants’ subjective ratings of anxiety and mental effort (in each condition) by using two distinctive visual-analogue scales (i.e., the ‘anxiety thermometer’, Houtman & Bakker, 1989; and Rating Scale for Mental Effort [RSME], Zijlstra, 1993). Furthermore, we continuously assessed participants’ heart rate by using a Polar wristwatch.

Shooting decisions. Shooting decisions were analyzed on the basis of the AIS data, by comparing the percentage of correct responses to GUN scenarios (i.e., shooting the suspect when he appeared with a gun) and the percentage of incorrect responses to NO-GUN scenarios (i.e., accidentally shooting the suspect when he appeared without a gun) in each condition.
Response times. Response times (ms) were analyzed using the AIS and expressed in relation to participants' shooting decisions in GUN and NO-GUN scenarios, respectively. Response times were measured from the first moment that the hands of the suspect became visible in the video scenarios (i.e., GUN / NO-GUN stimulus onset) until the firing of the gun by the participant.

Shot accuracy. Shot accuracy was analyzed on the basis of the AIS data and operationalized as the percentage of target (suspect) hits in response to GUN scenarios.

Gaze behavior. Gaze behavior was assessed through video analysis of the mobile eye data. This was done by two independent observers, rendering an inter- and intra-observer reliability of 96% and 99%, respectively. Based on our hypotheses, the analysis of gaze indices (e.g., numbers and durations of fixations) was divided into two parts (i.e., pre- and post-appearance; see Table 1). First, in the period before appearance of the suspect, we analyzed participants' scan ratio (operationalized as the number of fixations per second that was executed). Second, from the moment of appearance onwards we calculated (a) the time between the suspect's appearance and the onset of participants' fixation on the suspect (i.e., FoS onset), and (b) the duration of participants' fixation on the suspect before deciding to shoot or not to shoot (i.e., FoS duration). When participants decided to shoot the suspect (GUN correct / NO-GUN incorrect) FoS durations were calculated until the moment of shooting. When participants decided not to shoot the suspect (NO-GUN correct) FoS durations were calculated until the moment that participants' shifted their gaze towards the black taped square (see Task) to indicate their recognition of the NO-GUN scenario. Separate means were calculated for each type of decision.

Analytical strategy
To verify whether our manipulation of anxiety had been successful, differences between conditions (LA and HA) in our manipulation checks (anxiety, mental effort, and heart rate), were analyzed by using a MANOVA. A significant multivariate effect was evaluated using follow-up univariate ANOVAs. For each of the other variables (decision making, response times, shot accuracy, and gaze behavior), differences between conditions (LA and HA) were tested using one-tailed, paired samples t-tests.
For response times and FoS durations, additional t-tests were performed to compare response and fixation times between correct and incorrect shooting decisions in GUN and NO-GUN scenarios.

**Results**

An overview of the results for each of the dependent variables is presented in Table 5.1.

**Manipulation check**
The MANOVA that was executed on our measures of anxiety, mental effort, and heart rate showed a strong and significant multivariate effect of condition, $\lambda = .410$, $F(3, 33) = 15.84$, $p < .001$, $\eta^2 = .590$. Follow-up univariate ANOVAs showed that anxiety, mental effort, and heart rate were all significantly higher in the HA than in the LA condition, $F(1, 35) = 35.24$, $p < .001$, $\eta^2 = .502$, $F(1, 35) = 13.19$, $p = .001$, $\eta^2 = .274$, and $F(1, 35) = 5.69$, $p = .023$, $\eta^2 = .140$. Together, these results indicate that our pressure manipulation was successful.

**Shooting decisions**
As can be seen in Table 5.1, participants generally responded correctly to GUN scenarios, showing an average percentage of almost 100% correct responses, and a small difference between conditions, $t(35) = 2.50$, $p = .009$, ES = 0.49. In addition, anxiety had a strong and significant effect on the percentage of incorrect responses to NO-GUN scenarios, with participants shooting considerably more surrendering suspects in the HA than in the LA condition, $t(35) = 5.06$, $p < .001$, ES = 0.50.

**Response times and shot accuracy**
With respect to participants’ correct decisions in GUN scenarios, it appeared that response times were shorter in the HA than in the LA condition, $t(35) = 3.94$, $p < .001$, ES = 0.52. No differences between conditions were observed for the response times belonging to participants’ correct and incorrect decisions in the NO-GUN scenarios, $t(35) = 0.31$, $p = .378$, ES = 0.02 and $t(28) = 1.52$, $p = .070$, ES = 0.26. Because there were almost no incorrect decisions in relation to GUN scenarios, no response times are reported for this variable.
Because correct decisions in GUN scenarios and incorrect decisions in NO-GUN scenarios effectively led to the same outcome (i.e., shooting the suspect) we also compared response times between these types of decisions. As it appeared, participants’ incorrect decisions in NO-GUN scenarios were made significantly faster than their correct decisions in GUN scenarios (see Table 1). This result was observed in the HA as well as in the LA condition, $t(34) = 9.17, p < .001, ES = 1.18$ and $t(29) = 11.81, p < .001, ES = 1.32$.

Finally, shot accuracy decreased significantly under anxiety, $t(35) = 2.36, p = .012, ES = 0.33$ (see Table 5.1).

Table 5.1: Mean values and standard deviations for each of the dependent variables in the low-anxiety (LA) and high-anxiety (HA) condition.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Condition</th>
<th>LA M (SD)</th>
<th>HA M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manipulation Check</strong></td>
<td>Anxiety (0-10)</td>
<td>3.85 (2.19)</td>
<td>5.17 (2.39)**</td>
</tr>
<tr>
<td></td>
<td>Mental Effort (0-150)</td>
<td>56.00 (24.57)</td>
<td>63.53 (24.41)**</td>
</tr>
<tr>
<td></td>
<td>Heart Rate (beats/min)</td>
<td>94.22 (13.93)</td>
<td>97.01 (15.11)*</td>
</tr>
<tr>
<td><strong>Shooting Decisions</strong></td>
<td>GUN correct (%)</td>
<td>99.78 (0.97)</td>
<td>98.96 (2.08)**</td>
</tr>
<tr>
<td></td>
<td>NO-GUN incorrect (%)</td>
<td>11.81 (10.98)</td>
<td>18.29 (13.99)**</td>
</tr>
<tr>
<td><strong>Response Times</strong></td>
<td>GUN correct (ms)</td>
<td>493 (50)</td>
<td>467 (49)**</td>
</tr>
<tr>
<td></td>
<td>NO-GUN correct (ms)</td>
<td>1113 (249)</td>
<td>1109 (244)</td>
</tr>
<tr>
<td></td>
<td>NO-GUN incorrect (ms)</td>
<td>401 (55)</td>
<td>384 (62)</td>
</tr>
<tr>
<td><strong>Shot Accuracy</strong></td>
<td>Target/Suspect Hits (%)</td>
<td>83.71 (15.33)</td>
<td>78.14 (17.70)*</td>
</tr>
<tr>
<td><strong>Gaze Behavior</strong></td>
<td><strong>Pre-Appearance</strong></td>
<td>Scan Ratio (fixations/s)</td>
<td>1.75 (0.62)</td>
</tr>
<tr>
<td><strong>Post-Appearance</strong></td>
<td>FoS onset (ms)</td>
<td>182 (34)</td>
<td>181 (35)</td>
</tr>
<tr>
<td></td>
<td>FoS duration: GUN correct (ms)</td>
<td>394 (49)</td>
<td>372 (52)*</td>
</tr>
<tr>
<td></td>
<td>FoS duration: NO-GUN correct (ms)</td>
<td>584 (133)</td>
<td>577 (112)</td>
</tr>
<tr>
<td></td>
<td>FoS duration: NO-GUN incorrect (ms)</td>
<td>397 (113)</td>
<td>383 (58)</td>
</tr>
</tbody>
</table>

*p < .05, ** p < .01, *** p < .001

Note. ‘GUN correct’ refers to correctly shooting the suspect when he appeared with a gun. ‘NO-GUN correct/incorrect’ refers to correctly rejecting to shoot the suspect or accidentally shooting the suspect when he appeared without a gun. ‘FoS duration’ refers to the duration of the final fixation on the suspect before deciding to shoot or not to shoot.
B. Threat-related interpretation

Gaze behavior

With regard to participants’ scan ratio (pre-appearance), no significant difference between conditions was observed, \( t(19) = 1.08, p = .147, ES = 0.09 \). Similarly, no difference was observed for FoS onset (post-appearance), \( t(19) = 0.52, p = .306, ES = 0.04 \). With regard to the duration of participants’ fixations on the suspect, it appeared that FoS durations for correct decisions in GUN scenarios were shorter in the HA than in the LA condition, \( t(19) = 1.76, p = .047, ES = 0.43 \) (see Table 5.1). Finally, no differences were observed between conditions in relation to FoS durations for correct and incorrect decisions in NO-GUN scenarios, \( t(19) = 0.62, p = .271, ES = 0.06 \) and \( t(12) = 0.42, p = .342, ES = 0.17 \).

As with the response times, FoS durations were also compared between different types of decisions. This revealed that FoS durations were significantly shorter when participants shot the suspect (GUN correct, NO-GUN incorrect) than when participants did not shoot the suspect (NO-GUN correct). This was the case in the LA condition, \( t(19) = 5.56, p < .001, ES = 1.37 \) and \( t(14) = 4.59, p < .001, ES = 1.20 \), as well as in the HA condition, \( t(19) = 7.87, p < .001, ES = 1.52 \) and \( t(17) = 8.40, p < .001, ES = 1.46 \). No significant differences were observed between FoS durations for GUN correct and NO-GUN incorrect decisions, with \( t(14) = 0.31, p = .382, ES = 0.04 \) and \( t(17) = 0.72, p = .241, ES = 0.20 \) for the LA and HA condition, respectively.

Discussion

In the current experiment we investigated the effect of anxiety on police officers’ shooting decisions under pressure. Using a video-based simulation environment, we asked police officers to shoot or not to shoot at rapidly appearing suspects that either had a gun and ‘shot’, or had no gun and ‘surrendered’. We manipulated anxiety by using a so-called ‘shootback canon’ that could fire with small plastic bullets. We analyzed the officers’ decision making on the basis of their shooting responses and measured gaze behavior to explore whether anxiety-induced changes in visual attention could explain the observed effects.

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1 Due to technical difficulties, complete gaze data was only available for a subset of 20 participants. Additional analyses on each of the dependent variables (i.e., manipulation checks, shooting decisions, response times and shot accuracy) using these 20 participants, rendered the exact same pattern of results as with the complete group (36 participants).
We predicted that anxiety would cause officers to respond faster to threat, and shoot more often at suspects that surrendered. This is exactly what we found. Under anxiety, officers showed a response bias towards shooting, in the sense that more incorrect responses to NO-GUN scenarios were made in the high-anxiety condition than in the low-anxiety condition. In fact, the percentage of incorrect responses almost doubled, increasing up to 20% (see Table 5.1), and implying that in every 5 cases a surrendering suspect was shot. These findings are in line with results observed in weapon identification tasks (e.g., Correll et al., 2002; Fleming et al., 2010; Payne, 2001) and indicate that under anxiety, police officers have more difficulty to inhibit emotion-congruent (threat-related) responses (Eysenck et al., 2007; see also Payne, 2006).

As predicted, officers also tended to respond faster to threat-related information when they were anxious (cf. Correll et al., 2002; Fleming et al., 2010; Payne, 2001). That is, when correctly shooting in GUN scenarios, response times were ~30 ms (6%) faster in the high-anxiety condition than in the low-anxiety condition (see Table 5.1). In this regard, it is important to recall that response times not only included the officers’ initial reaction times to the stimulus onset (movement initiation), but also movement times (moving and aiming the gun in the direction of the suspect) and the execution of the shot (pulling of the trigger). As such, with 500 ms (Table 1), response times were already very fast (cf. Heath, Nealy, & Krigolson, 2008; White, Kerzel, & Gegenfurtner, 2006) and any further reduction may have seriously affected shot accuracy. In this case, shot accuracy decreased significantly under anxiety with ~5%, which — given the relatively small reduction in response time — is in line with previous findings (cf. Nieuwenhuys & Oudejans, 2010, 2011).

As appeared from our analysis of gaze behavior, the visual information that was available to the officers was largely the same in both conditions. That is, with the exception of an expected decrease in the duration of fixations on the suspect when shooting in GUN-scenarios (cf. Nieuwenhuys & Oudejans, 2011; Vickers & Williams, 2007; Wilson, Vine et al., 2009), which occurred together with a similar decrease in response time, no differences existed between conditions for any of the parameters that were assessed. Officers scanned the environment at an equal pace, detected the suspect with the same speed, and fixated the suspect equally long in the high- and low-anxiety conditions. The only significant difference that was observed occurred regardless of the officers’ level of anxiety and indicated that fixations on the suspect were almost twice as short for shooting responses than for not-shooting responses.
B. Threat-related interpretation

(see Table 5.1). This finding suggests that, in general, the officers may have regarded the GUN scenarios as more important than the NO-GUN scenarios, causing them to maintain focus on surrendering suspects to reassure themselves that there really was no threat.

Because anxiety appeared to have little or no effect on gaze behavior, we have to conclude that the availability of visual information per se cannot explain why officers were faster and accidentally shot more surrendering suspects when they were anxious. As such, it may be that instead of visual attention being affected, a stronger expectancy of threat caused the officers to either disregard the visual information that was available, or interpret it differently (e.g., Calvo & Costillo, 2001; see also Blanchette & Richards, 2010; Bishop, 2007). In this regard, it is important to note that when the officers accidentally shot the suspect in NO-GUN scenarios, their shooting responses were ~ 100 ms (20%) faster than when they correctly shot the suspect in GUN scenarios (see Table 5.1). Because such fast responses are hardly possible (e.g., Heath et al., 2008; White et al., 2006), this provides further evidence that incorrect shots were not executed on the basis of information about the suspect’s weapon (i.e., GUN or NO-GUN). Alternatively, already expecting the suspect to show up with a gun may have caused the officers to respond with shooting as soon as they perceived the suspect’s location (i.e., left or right window). This information was available from the moment the suspect’s head appeared, which was approximately 100 ms before his hands became visible (see Method). Because the occurrence of incorrect shooting responses was significantly higher under anxiety (i.e., significantly more suspects were shot accidentally in the high-anxiety condition), we conclude that when they were anxious, the officers had a stronger expectation of threat, which caused them to shoot earlier and make more mistakes.

This explanation of the results is in line with what the officers’ reported after completing the experiment. That is, many officers reported that with the shootback canon turned on (in the high-anxiety condition), the first sight of the suspect was often sufficient to expect a gun and trigger a shooting response. In this respect, Bishop (2007) has argued that under anxiety, increases in activation of the amygdala (an important emotional center in the brain) are coupled to decreases in the recruitment of prefrontal control mechanisms. As a consequence, attentional control is diminished under anxiety, and people are more inclined to respond on the basis of threat-related inferences and expectations (i.e., increased stimulus-driven processing) rather than
objective, task-relevant visual information (i.e., decreased goal-directed processing; see also Blanchette & Richards, 2010; Eysenck et al., 2007).

In contrast to the current results, other studies did show that gaze behavior changes when people perform a perceptual-motor task under anxiety (e.g., Janelle, 2002; Nieuwenhuys & Oudejans, in press, Vickers & Williams, 2007; Wilson et al., 2009). However, other than in the current experiment, these studies did not involve decision making or the explicit judgment about the nature (or size) of a specifying variable (e.g., GUN or NO-GUN). Studies that did investigate this showed that differences in psychological (or physiological) states can lead to differences in visual perception (Proffitt, 2006a). For instance, people who are afraid of heights, tend to see heights as being higher than people who are not afraid of heights (e.g. Teachman et al., 2008). This difference is observed despite of the fact that participants were looking down from the same point (in this case a balcony), suggesting that even when the same visual information is available, emotional factors such as anxiety can affect our perception. Although with respect to the current experiment, such processes cannot explain why officers responded faster when they accidentally shot a surrendering suspect, they do help to explain why the availability of visual information — which was largely the same in both conditions — did not stop the officers from making more mistakes when they were anxious. Possibly, in contexts that require judgment and decision-making under anxiety, a stronger expectation of threat may lead to faster emotion-congruent responses, and more false-positive errors, while at the same time, affective influences on perception make sure that what we perceive is in line with what we feel and expect.

Concerning the work of police officers, for whom the experience of extreme pressure and anxiety is at the very heart of their job, the current results provide more insight into the effect that anxiety may have on shooting decisions. Our findings connect to earlier studies on police officers’ shooting decisions under pressure (e.g., Correll et al., 2002; Fleming, 2010; Payne, 2001) but provide an important extension in terms of connecting cognitive processes (e.g., weapon identification) with actual behavior (e.g., shoot or don’t shoot). Our finding that anxiety may lead to a stronger expectation of threat and, hence, to faster and less accurate emotion-congruent responses, may also apply to other contexts that require judgment and decision making under pressure. It is important that future studies try to improve our understanding of these phenomena, and explore the extent to which reality-based training interventions may help people to execute more control over their decisions under stressful circumstances (e.g., Oudejans, 2008; Nieuwenhuys & Oudejans, 2011).