Police performance under pressure: Arrest and self-defence skills

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Content

CHAPTER 1

General Introduction

Introduction

From time to time, police officers experience physical violence during work (Naeyé, 2005; Timmer, 2005). Most cases of physical violence concern resistance during arrest (Naeyé, 2005). Other examples of situations involving physical violence are getting control over people under influence of alcohol or drugs, bystanders who interfere with police actions, or aggression during mediation of quarrels. To enforce law, and secondly, to defend themselves against physical violence, police officers in the Netherlands have a legally established authorization to apply force. For that purpose, they learn and train arrest- and self-defence skills (ASDS) during regular police training. To investigate the effectiveness of the regular ASDS training, the current thesis reports five studies that investigated how well officers feel prepared, how they perform in threatening situations, and whether the current form of training can be improved.

This introduction first describes how the authorization to apply force, examination of skills, and skill training are established in the Netherlands. Then, it discusses how the stressful nature of violent situations can influence police performance, including the results of an earlier study that showed that ASDS performance is negatively affected by anxiety (Nieuwenhuys, Caljouw, Leijsen, Schmeits, Oudejans, 2009). This study not only yielded new insights (e.g., how to assess ASDS performance in an experiment), but also new questions, that were partly the motivation for this thesis. The last paragraph of this introduction describes the study aims and the structure of this thesis.

Preparation for violence: authorisation, examination and training

Authorisation to apply force

The authorisation to apply force on duty brings much responsibility. In the Netherlands, this is established in the Police Act (2012) and the Police instructions (1994). Article 4 of the Police instructions states that police officers are only allowed to use police force if they are trained in using it correctly, and if they use it only in situations for which using police force is warranted. Furthermore, article 7 of the Police Act states that officers are allowed to use police force if it is in proportion with the threat and the intended goal cannot be accomplished in another way. If possible, warnings should precede police force.

Being trained is conceptualised in the regulation for the examination of law-enforcement skills for the police (in Dutch, 'Regeling Toetsing en Geweldbeheersing Politie' [RTGP]), introduced in January 2002. With introducing this regulation, 32 hours per year were made available for officers to train their skills and to participate in the examinations of handgun shooting (twice per year), ASDS (once per year) and knowledge of violence control (once per year). Passing the examinations is required to be allowed to carry police weapons and use police force.

Examinations

The Dutch ASDS exam mainly focusses on correct skill execution. Officers work in pairs and execute the requested skills generally on another colleague who acts as a suspect and is not assessed at that moment. The execution of ASDS during examination deviates from the line of duty in a number of ways. Officers receive instructions on which skills to use, while on duty, officers have to interpret the situation and choose their actions themselves. By acting on their own insight, other variables next to skill execution play an important role. For instance, officers have to judge whether force is needed and if so, the used force needs to be in proportion with the threat in that situation. Such aspects are less addressed in the current form of examination.

Furthermore, the colleague that acts as the suspect is often a cooperative suspect. He or she behaves not or just a little aggressive and hardly resists during skills execution by the officers who are assessed. On duty, aggression is certainly reality (e.g., Naeyé, 2005), by which officers could experience anxiety (Anderson, Litzenberger, & Plecas, 2002), a variable that is mostly not included during examination. That seems remarkable as research has repeatedly shown that anxiety negatively affects police performance (Nieuwenhuys et al., 2009; Nieuwenhuys & Oudejans, 2010; Oudejans, 2008).

Given the difference in threat and anxiety between examinations and the line of duty, officers often act differently during examinations than on duty. In addition, the current ASDS find their origin in sports and can be executed well in a controlled setting such as during an ASDS examination. However, there are indications that these skills are more difficult to apply against aggressive suspects on duty, especially if anxiety affects officers action possibilities (cf. Pijpers, Oudejans, Holsheimer, & Bakker, 2003). Because of the differences between the examinations and the line of duty, many officers see the examinations more or less as a play than as an assessment of skill for the line of duty (Witzier, 2006). Taken together, the above mentioned issues may suggest that the ASDS examinations do not sufficiently assess the skills needed on duty.

Training

Besides the yearly ASDS examination (for which officers receive about an hour to prepare), Dutch officers receive two or three practice days per year. The standard program of such days consists of two hours theory, two hours ASDS training, two hours handgun training, and two hours training practical situations. Altogether, this means that officers effectively train their ASDS about four to six hours per year (see Timmer & Pronk, 2011 for comparable situations in other EU countries). Despite the limited possibilities to train their ASDS, the National Police, but also the Dutch society expects that officers perform at a professional level. It is questionable whether that is reasonable given the little possibilities for training. That assumption is underlined by Timmer (2005) who states that in violent situations (regular) officers frequently have difficulties to act in a structured way and that they can hardly rely on well-trained procedures.

Anxiety

Besides the few possibilities for training, anxiety is often another limiting factor for effective performance on duty. As a result of aggressive behaviour of one or more suspects or the importance of performing well, officers may experience anxiety (Anderson et al., 2002). Anxiety can be defined as ''an aversive emotional and motivational state in threatening circumstances'' (Eysenck, Derakshan, Santos, & Calvo, 2007, p. 336), and is ''related to the subjective evaluation of a situation, and concerns jeopardy to one's self-esteem during performance or social situations, physical danger, or insecurity and uncertainty'' (Schwenkmezger & Steffgen, 1989, p. 78, 79).

In previous years, many studies have shown that anxiety negatively affects perceptual-motor performance (e.g., Behan & Wilson, 2008; Causer, Holmes, Smith, & Williams, 2011; Nieuwenhuys, & Oudejans, 2010; Nieuwenhuys, Pijpers, Oudejans, & Bakker, 2008; Wilson, Wood, & Vine, 2009). Still, researchers have been divided on the process that causes that effect. On one hand, distraction theories (e.g., attentional control theory; Eysencket al., 2007) argue that anxiety causes a shift in attention from task-relevant (goal-driven) information towards task-irrelevant (stimulus-driven) information. Stimulus-driven attention can be external such as a threat or internal such as worries about failure and its consequences. With the shift in attention to task-irrelevant information, less attention is available to focus on the current task, which often results in worse performance. On the other hand, skill focus theories (e.g., explicit monitoring, Beilock & Carr, 2001) argue that anxiety leads to more inward attention in trying to explicitly control or monitor someone's own movements. Although for novices skill focus is necessary to learn and improve skill execution, monitoring movements can seriously harm experts' performance as they normally execute their skills automatically (see for example Beilock & Carr, 2001; Gray, 2004).

Nieuwenhuys and Oudejans (2012) argued that distraction and skill focus theories may not be mutually exclusive. They argued that when, for instance, a skilled tennis player is playing a tournament final and experiences that her backhand is not performing as usual, her attention may be drawn towards the execution of her backhand. This example is compatible with the argumentation of the skill focus theories, but it is also possible to label her shift in attention as a distraction away from information that is task-relevant for this skilled tennis player. Therefore, Nieuwenhuys and Oudejans (2012) argue that both theories are based on similar principles. That is, anxiety shifts attention towards stimulus-driven stimuli leaving less attention to adjust and calibrate movements based on goal-driven (task-relevant) information. On the basis of the two existing frameworks, Nieuwenhuys and Oudejans (2012) introduced an integrated model concerning anxiety and perceptual-motor performance explaining various ways in which anxiety affects performance. The core of their model is based around the assumption that anxiety can affect people's attention, interpretation, and response tendencies.

That these assumptions are highly relevant for police work became visible in Nieuwenhuys' PhD-thesis entitled "Effects of anxiety on police officers' shooting behaviour under pressure" (2012). For instance, a number of studies showed that officers looked less at their targets when they were more anxious indicating less goal-driven attention (Nieuwenhuys & Oudejans, 2010, 2011). However, other studies showed changes in officers' decision making while their gaze behaviour appeared to be similar to when they were less anxious (Nieuwenhuys, Savelsbergh, Oudejans, 2012; Nieuwenhuys, Cañal-Bruland, Oudejans, 2012). Nieuwenhuys, Savelsbergh, and Oudejans (2012) suggested that officers' interpretation of threat may have been changed and that they made their decisions on the basis of perceived threat rather than actual information about the situation (e.g., whether the suspect had a gun in his hand).

All in all, the anxiety-induced changes in attention or interpretation led to changes in response tendencies. In Nieuwenhuys and Oudejans (2010, 2011), officers' changes in attention led to ducking more down and speeding up their actions in attempts to decrease the chance of getting hit. As a result, they shot less accurate. In Nieuwenhuys, Savelsbergh, and Oudejans (2012) and Nieuwenhuys, Cañal-Bruland, and Oudejans (2012), officers' assumed threat interpretation led to shooting earlier. In Nieuwenhuys, Savelsbergh, and Oudejans (2012), officers also made more inaccurate decisions regarding whether or not to shoot a suddenly appearing suspect who either appeared with his hands up and surrendered or appeared with a handgun and shot at the officer (in a video-simulation set-up).

Thus, Nieuwenhuys' thesis shows that anxiety can have serious consequences for performance on duty. The studies show consistently that police officers' attention, interpretation, and response tendencies concerning handgun shooting are often affected by anxiety. However, although situations with physical violence occur more often on duty than situations with handgun shooting, the situations with physical violence are less often investigated. Still, Nieuwenhuys et al. (2009) took the first step to examine the influence of anxiety on ASDS performance. To assess the quality of ASDS performance, they worked with 5-point Likert scales. The scales were found reliable and valid and therefore an effective tool to assess officers' ASDS performance. To examine the influence of anxiety, officers performed a number of skills on a foam strike field in the low-anxiety condition and the same skills against an aggressive looking and behaving suspect in the high-anxiety condition (but in the end he did not really resist). The assessment of officers' performance showed that they had performed worse in the high-anxiety condition than in the low-anxiety condition. Yet, the overall assessments did not give insight into why performance became worse under anxiety. Given the fact that most officers frequently face physical violence, it is important to optimize training, and as a result, performance on duty. To achieve that, it is essential to gain more insight into the influence of anxiety on ASDS performance, which was the general aim of the research reported in the current thesis.

Study aims

As most results concerning anxiety and police performance are collected in experimental settings, it would be interesting to first investigate whether the results of those experiments match officers' perceptions of their performance on duty. To answer that question, a questionnaire study investigated officers' perceptions of how well they feel prepared and able to manage violence on duty (Chapter 2). That study further explored whether officers' experience with violence (more vs. less) and how often offers experience anxiety (often vs. less often) influenced these perceptions.

Furthermore, it is important to gain more insight into the precise elements of performance that are affected by anxiety such as the kinematics of task execution. Therefore, Chapter 3 describes an experiment in which posture and movement variables were collected when officers performed several ASDS in a low- and a high-anxiety condition. Next, in police performance on duty eventual skill execution may not be the only factor that is negatively affected. Communication and proportionality are examples of other elements of police performance that also need to be taken into account. Chapter 4 describes an experiment in which officers had to choose and initiate their actions themselves while they had to arrest a non-cooperative suspect. Besides on overall performance, officers' performance was assessed on communication, distance to the suspect, proportionality of applied force, quality of skill execution, and handcuffing.

These three studies were also designed to provide input for how ASDS training can be improved with the aim to reduce the negative influence of anxiety on performance. The first question was whether an increase in training frequency would lead to a reduced negative influence of anxiety (Chapter 5). To this end, officers with and without additional martial arts experience performed several ASDS in a low- and high-anxiety condition. The second question was whether ASDS training would improve if it consists more of skills that are based on primary reflexes (Chapter 6). To this end, officers received a reflex-based self-defence training (FIRST™) and a regular ASDS training (control training) after which performance was assessed in six realistic scenarios. Finally, Chapter 7 (Epilogue) summarizes and highlights the main findings of the experiments. It also describes implications for future scientific research. Finally, it enumerates a number of practical implications for possible improvements of ASDS training. The upshot of this discussion is that, if possible, the frequency of ASDS training should be increased. Even if that is not possible, the content of the trainings can be adjusted such that improved performance on duty is to be expected (e.g., more realistic and more reflex-based). In that way, officers may be better prepared for performance in threatening situations on duty.

CHAPTER 2

Dutch police officers' preparation and performance of their arrest and self-defence skills: A questionnaire study

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Abstract

We investigated how Dutch police officers perceive their preparation for arrest and self-defence skills (ASDS) and their ability to manage violence on duty. Furthermore, we assessed whether additional experience (i.e., by having encountered violence on duty or by practicing martial arts) and self-perceived anxiety have an influence on these perceptions. Results of an online questionnaire (n = 922) showed that having additional experience was associated with self-perceived better performance. Officers who experience anxiety more often, on the other hand, reported more problems. Although most officers report sufficiently effective performance on duty, they, especially those with additional experience, feel that training frequency is too low and that the currently taught ASDS are only moderately usable (at least with the current amount of training). Based on the results, we suggest that increasing officers' ASDS experience, teaching officers to perform with high anxiety, or reconsidering the taught skills, may be necessary to further improve performance of police officers on duty.

Key Words: Anxiety; Deliberate practice; Perceptual-motor performance

Introduction

Although police work is largely sedentary (Anderson & Plecas, 2000), police officers occasionally have to deal with violence. Violence with which officers are confronted ranges from verbal threat to actual shoot-outs. Armed situations, especially handgun shootings, have already received considerable attention in the literature (Morrison & Vila, 1998; Nieuwenhuys & Oudejans, 2010, 2011; Oudejans, 2008). However, officers are more frequently confronted with unarmed physical violence (Timmer, 2005). For example, officers may be confronted with suspects who threaten them, resist arrest, or punch them. In these situations, officers have to perform with appropriate force without using a handgun. Over the past decades violence against police officers has steadily increased, resulting in more work-related injuries and higher recovery and replacement costs (Timmer & Pronk, 2011). At the same time, however, there is little information about officers' ability to adequately manage violence on duty or factors that may influence this ability. Against this background – and to open up new ways for improving police effectiveness – the current study investigated Dutch police officers' perceptions of their preparation and performance of arrest and self-defence skills (ASDS).

In preparation for violent situations, police officers in the Netherlands train a fixed set of arrest and self-defence skills ranging from techniques to control a suspect to actual combat techniques such as punching and kicking. For more threatening situations, officers have the option to use a short baton or pepper spray (cf. Nieuwenhuys, Caljouw, Leijsen, Schmeits, & Oudejans, 2009). Dutch ASDS have been developed as part of a police assessment program on competences concerning violence control (Witzier, 2006). The motivation for this program is to ensure that officers have a certain level of competence in the line of duty. Each year, they have to pass an exam to be allowed to conduct active service. The exam consists of a theoretical test, a handgun shooting test, an ASDS test and a physical fitness test. Regarding ASDS, officers operate in pairs in which they have to execute prescribed skills on one or two colleagues. Besides the exam itself, officers receive two or three practice sessions per year, adding up to about four to six hours of ASDS training per year (see Timmer & Pronk, 2011 for comparable situations in other EU countries).

Training ASDS for four to six hours per year seems hardly sufficient to reach a high level of expertise (cf. Ericsson et al., 1993). Indeed, it is well-known that individuals need many hours of deliberate practice (Ericsson, 1996) and hundreds of thousands of repetitions (e.g., Crossman, 1959; Kottke, 1980) to become an expert in perceptual-motor skills. For instance, Ericsson et al. (1993) found that expert musicians spent about twenty-five hours of practice a week (over ten years), whereas amateur musicians did not spend more than two hours a week. Because Dutch ASDS training does not even reach two hours a week, it seems that officers are not optimally prepared to manage violence on duty. Moreover, performing in violent situations is often accompanied by increased pressure (e.g., Anderson, Litzenberger, & Plecas, 2002) whereas typical ASDS

training sessions in the Netherlands take place under low-pressure circumstances. This discrepancy between circumstances on duty and during training makes it even harder (next to the low training frequency) for officers to perform effectively in high-pressure situations on duty. Indeed, several studies have shown that officers do not perform as well under high-pressure circumstances as they do under low-pressure (training) circumstances (e.g., Nieuwenhuys & Oudejans, 2010; Renden et al., 2014).

Given the limited number of training hours as well as the difficulty of performing under pressure, it is worth investigating how experience (in performing ASDS) and anxiety are related to the perceived ability to perform effectively on duty. Insight into these issues may give leads to improve police training to better prepare officers for violence during their work. As no institution in the Netherlands has a systematic and conclusive overview of the use of legal force on duty (Timmer, 2005), we aimed to perform our study on a large scale to provide data based on officers experiences from their work. Therefore, using an online questionnaire, we investigated police officers' perceptions of how well they feel prepared and able to manage violence on duty. We further explored the effects of a) additional experience with ASDS (e.g., obtained by encountering violence on duty or by practicing martial arts), and b) how often officers experience anxiety in the line of duty (e.g., during the arrest of an aggressive suspect).

Additional experience

Officers may gain more experience with ASDS (or comparable skills) in other ways than in regular police training. For instance, officers gain experience when they frequently have to apply ASDS on duty. Or they could train comparable skills in martial arts (such as kickboxing or krav maga) during their leisure time. Because additional experience presumably leads to a higher level of skill (cf. Ericsson, 1996), we expect perceived real-life ASDS performance of officers with additional experience (on duty or martial arts) to be better than that of officers with no additional experience. Whether this is the case and whether officers with additional experience only apply the taught ASDS or also resort to alternative skills remains to be determined. Because officers receive limited practice, additional experience (on duty or martial arts) will often be greater than ASDS experience, which makes it plausible that officers might apply alternative skills rather than the fixed set of ASDS that is taught in police training. Thus, how Dutch officers perceive their ASDS training and how the assumed shortcomings in ASDS training become manifest on duty, could depend on the degree to which officers have additional experience.

Anxiety

ASDS situations are often accompanied by increased pressure, possibly leading to anxiety (Anderson et al., 2002). Anxiety has often been put forward as an important influential factor regarding how well officers perform in the line of duty (e.g., Nieuwenhuys &

Oudejans, 2010). Several experimental studies have found that officers performed worse in high-anxiety situations compared to low-anxiety situations concerning handgun shooting (e.g., Nieuwenhuys & Oudejans, 2010, 2011: Nieuwenhuys et al., 2012; Oudejans, 2008) as well as execution of ASDS (e.g., Nieuwenhuys et al., 2009; Renden et al., 2014). However, whether these effects can also be observed in officers' perception of their actual performance on duty, remains to be verified.

Concerning situations that are potentially suitable for ASDS, officers may experience anxiety, for instance, during large fights, while arresting aggressive suspects (especially because of capricious behaviour of the suspect), or when acting without a partner (Anderson et al., 2002; Bleijendaal, 2006). Given the established impact of anxiety on police officers' performance, how Dutch officers perceive their ASDS training and how the assumed shortcomings in ASDS training become manifest on duty, could depend on how often officers experience anxiety in the line of duty.

Study aims

Officers train their ASDS (against non-lethal violence) very little and several experiments have shown that officers perform worse in high-pressure circumstances (as on duty) than they do in training circumstances (e.g., Nieuwenhuys & Oudejans, 2010, 2011; Nieuwenhuys et al., 2009; Renden et al., 2014). This study aimed to investigate how these matters relate with officers' perceived ability to perform effectively on duty, with a large sample of officers with varying levels of experience (e.g., years, situations). Our first aim was to investigate police officers' perceptions of how well they feel prepared and able to manage violence on duty. Our second aim was to explore whether and how additional experience influences these perceptions. Our third aim was to investigate whether and how anxiety influences these perceptions.

Hypotheses

On the basis of previous research, we had the following expectations. Regarding general attitude towards preparation and performance, we expected officers to be critical towards their preparation, especially towards the number of training hours (e.g., Witzier, 2006). Nevertheless, because officers are educated to perform at a certain level and they are generally able to perform their duties, we expected that they would still perceive their overall performance to be sufficiently effective. Furthermore, we expected that officers' perceived performance effectiveness would be positively influenced by additional experience (e.g., Ericsson, 1996), and that it would be negatively influenced by anxiety (e.g., Renden et al., 2014). In addition, we expected that more experienced officers[1]

1 *In the remainder of the article, we refer to officers with or without additional experience with violence or martial arts as more experienced officers and less experienced officers, respectively.*

would report applying alternative skills (instead of the taught ASDS) more often than less experienced officers.

Method

To examine a large sample of officers with many levels of experience (e.g., years, situations), we obtained data about officers' performance-related experiences on duty, using a questionnaire that was distributed online. In our search for a representative sample of officers (i.e., as representative as possible within this study), we found four departments that were willing to distribute the questionnaire among their officers. These four departments are spread throughout the country covering different areas in the Netherlands (including large as well as smaller cities with officers of different ages, working experience and ranks). Consequently, our findings could not be interpreted as area or department specific. An implication (and possible limitation) of this method could be that we cannot rule out that there may be regional differences in, for instance, self-reported performance. However, such differences are beyond the scope of the current paper. As such, we would like to argue that this method gives us a more representative sample, and thus insight into perceptions of officers in the Netherlands than selecting one single department.

The questionnaire was made available online to respondents via a program called 'eXamine' (eXamine 2.0, eXamine BV, Amsterdam, the Netherlands). Potential respondents (officers) received an email with a link that gave them access to the questionnaire. In total, 922 police officers (742 men, 180 women), with a mean age of 41.4 years (SD = 10.9) and a mean working experience of 17.9 years (SD = 11.7), completed the questionnaire. A total overview of the characteristics is presented in Table 2.1 in the Results section. All data were collected anonymously.

Questionnaire design

In consultation with experienced police instructors, we developed a questionnaire that measured Dutch police officers' self-perceived preparation and skill in dealing with physical violence. The questionnaire contained three sections: 'Descriptive information', 'Experience and anxiety', and 'ASDS preparation and skill'. The section 'Descriptive information' contained four questions concerning gender, age, working experience, and rank.

The section 'Experience and anxiety' contained three questions: 'How often, until this moment, have you experienced violence during your career', 'Do you have experience with martial arts', and 'In violent situations, I experience anxiety'. Violence is defined by the Dutch police as any compulsive force exercised on people. Martial arts are traditions of combat practices such as kickboxing, karate, krav maga. To the questions concerning experience with violence and anxiety, respondents answered on a 5 point Likert-scale (1-5), with (1) 'never', (2) 'sometimes', (3) 'regularly', (4) 'often', (5) 'very often'. To

the question concerning experience with martial arts, respondents answered whether they had (1) 'no experience', (2) 'experience from the past', (3) or 'current experience'.

The section 'ASDS preparation and skill' contained seven targeted constructs with in total 25 items and one open question. Table 2.2 in the Results section provides an overview of each of the items. Officers responded to the items on a 5-point Likert scale (1-5), with (1) 'strongly disagree', (2) 'disagree', (3) 'neutral', (4) 'agree' or (5) 'strongly agree'. A brief discussion of the targeted constructs is presented below.

ASDS preparation. This construct contained six items about whether officers are satisfied with the skills that they are taught, how ASDS training is provided to them and the frequency of ASDS training. Example items are 'I am satisfied with the current range of taught ASDS' and 'The frequency of ASDS trainings is sufficient to adequately apply ASDS in violent situations' (see Table 2.2 in the Results section for a complete overview of the items).

ASDS use. This construct contained five items about whether officers actually apply the taught ASDS on duty and whether they feel they need these skills to perform effectively. Example items are 'During violent situations, I only apply the taught ASDS' and 'During violent situations, I am able to perform effectively without applying the taught ASDS'.

Overuse of legal force. This construct contained two items about whether officers feel they apply legal force too early or with more force than necessary (i.e., disproportionally). An example item is 'After a violent situation, I have the feeling that I applied more legal force than necessary'.

Underuse of legal force. This construct contained two items about whether officers feel they apply legal force too late or with less force than necessary. An example item is 'After a violent situation, I have the feeling that I applied less legal force than necessary'.

Problems with skill execution. This construct contained two items about whether officers feel they apply incorrect skills or whether they execute skills incorrectly. An example item is 'After a violent situation, I have the feeling that I applied the wrong skills'.

Performance effectiveness. This construct contained four items about whether officers feel they experience problems in violent situations, avoid violence or whether they are able to perform effectively. Example items are 'During violent situations, I know what I am doing' and 'During violent situations, I experience problems'.

More frequent and more realistic training. This construct contained four items about whether officers feel they would experience less anxiety or perform more effectively in violent situations if they would receive more (reality-based) training. Example items are 'In case of more ASDS training, I will experience less anxiety during police work' and 'If training sessions become more reality-based, my ASDS performance in violent situations will improve'.

Open question. The questionnaire ended with an open question that asked how, if necessary, ASDS preparation could be improved.

Analysis approaches

For analysing our data, we examined the distribution of the additional experience and anxiety questions and calculated correlations between working experience and additional experience to check how these were related. Further, we performed factor analysis to confirm our targeted constructs, descriptive statistics to give insight in officers' general attitudes, Pearson correlations to investigate relations between additional experience and anxiety and the seven constructs, and regression analysis to investigate which factors predicted anxiety and performance effectiveness.

To investigate the officers' general attitude regarding preparation and performance, mean scores,[2] medians and modes were calculated and reported concerning the 25 items. Concerning the answers towards the open question, the suggestions were categorized by one experimenter. A second person who was not involved in this study performed a reliability check by repeating the same procedure for statements of at least 10% of the respondents.

To investigate the role of experience and the role of anxiety, we calculated construct means. For that purpose, outcomes of negatively formulated statements were recoded to match the scores of the positively formulated statements (indicated with '*' in Table 2.2). The items of constructs 'problems with skill execution', 'overuse of legal force' and 'underuse of legal force' were not recoded as the construct titles were negatively formulated per definition. Pearson's correlation coefficients were calculated using the construct means per participant as well as the factors 'experience with violence', 'experience with martial arts' and 'feelings of anxiety' leading to a ten-by-ten correlation matrix (see Table 2.3). Correlation coefficients $r < .30$, $r \geq .30$ and $r \geq .50$ were considered to have small, medium and large strength, respectively (Cohen, 1988).

In addition, we performed two regression analyses. We examined whether, and if so, how 'experience with violence', 'experience with martial arts', 'gender' and 'age', predicted the outcome variable 'anxiety'. We also examined whether, and if so, how 'experience with violence', 'experience with martial arts', 'feelings of anxiety', 'gender' and 'age', predicted the outcome variable 'performance effectiveness'. We choose to perform hierarchical multiple regression analyses to examine the additional predictive value of different elements of the regression models. At Step 1 in the model examining 'anxiety', we entered 'experience with violence' and 'experience with martial arts'. At Step 2, we entered 'gender' and 'age'. At Step 1 in the model examining 'performance effectiveness', we entered 'experience with violence' and 'experience with martial arts'. At Step 2, we entered 'anxiety' and at Step 3, we entered 'gender' and 'age'. The alpha level for significance was set at .05. Effect sizes were calculated using Cohen's f^2, with

2 *We interpreted mean scores of 2.49 and lower as "disagree", scores between 2.50 and 3.49 as "neutral", and scores of 3.50 and higher as "agree".*

0.02 or less, about 0.15 and 0.35 or more, representing small, moderate and large effects, respectively (Cohen, 1988).

Results

A total overview of respondents' gender, age, working experience, ranks, additional experience, and how often they experienced anxiety in total, and per department, is presented in Table 2.1. This overview shows that generally, characteristics of respondents are comparable across departments.

Additional experience and anxiety

Concerning experience with violence, on average, officers reported a score of 3.10 (see Table 2.1). The distribution of the answers was: never: 5.4%; sometimes: 19.4%; regularly: 44.5%; often: 21.6%; very often: 9.1%. Concerning experience with martial arts, 61.4% of the officers reported to have no experience, 29.7 reported to have experience from the past, and 8.9% reported to have current experience. Concerning anxiety, on average, officers reported a score of 3.55. The distribution of the answers was: never: 1.7%; sometimes: 8.2%; regularly: 29.1%; often: 46.3%; very often: 8.7%. Pearson correlations showed that 'working experience' only showed a weak positive correlation with 'experience with violence' and a weak negative correlation with 'experience with martial arts', $r = .18$, $p < .001$, $r = -.09$, $p < .05$. These figures show that general working experience does not necessarily entail experience in using self-defence skills (e.g., either on duty or in performing martial arts).

Table 2.1. Overview of characteristics of the total sample and per police department (SDs between parentheses).

	Total *n* = 922	Dep. 1 *n* = 228	Dep. 2 *n* = 218	Dep. 3 *n* = 258	Dep. 4 *n* = 218
Gender					
Men	742	171	188	222	161
Women	180	57	30	36	57
Age (years)	41.35 (10.86)	37.96 (10.63)	43.24 (10.27)	42.71 (11.06)	41.35 (10.67)
Working experience (years)	17.89 (11.66)	14.00 (9.93)	19.55 (11.27)	19.63 (12.28)	18.23 (12.10)
Rank					
Commissioner	1	0	0	1	0
Superintendent	10	1	2	6	1
Inspector	107	54	19	20	14
Sergeant	309	56	75	95	83
Constable first class	332	70	86	94	82
Constable	48	16	14	13	5
Police patrol officer	46	15	2	18	11
Police trainee	69	16	20	11	22
Experience with violence (1: never - 5: very often)	3.10 (0.99)	3.08 (0.98)	3.09 (0.96)	3.19 (0.98)	3.00 (1.05)
Experience with martial arts					
Current	82	24	23	29	6
Past	274	65	68	83	58
No	566	139	127	146	154
Anxiety (1: never - 5: very often)	3.55 (0.85)	3.57 (0.91)	3.53 (0.85)	3.58 (0.81)	3.52 (0.83)

Factor analysis

As can be seen in Table 2.2, factor analysis confirmed our targeted constructs as separate dimensions. On the total collection of items (25), it yielded seven constructs with eigenvalues greater than 1.0, and these accounted for 64.05% of the variance. All 25 items showed Varimax rotation factor loadings and item-total correlations of 0.30 or more. Factor analysis further showed satisfactory Alpha coefficients: ASDS preparation: 0.81; ASDS use: 0.69; Overuse of legal force: 0.67; Underuse of legal force: 0.60; Problems with skill execution: 0.70; Performance effectiveness: 0.70; More frequent and more realistic training: 0.87. In short, these data show that the questionnaire indeed captured seven separate constructs and that each item within a construct sufficiently contributed to that construct and not to another. Furthermore, the data show that the items within a construct show sufficient coherence.

Table 2.2. Factor loadings, item-total correlations, mean scores (SDs between parentheses), medians and modes on the items per construct. A score of 1 indicates 'strongly disagree' and a score of 5 'strongly agree'.

	Factor loading	Item-total correlation	Mean (SD)	Recoded (if necessary)	Median	Mode
ASDS preparation						
1. I am satisfied with the current range of taught ASDS	0.84	0.74	2.64 (1.11)	2.64 (1.11)	3	3
2. The taught ASDS are useful skills in violent situations	0.55	0.52	3.30 (1.01)	3.30 (1.01)	3	4
3. The taught ASDS are easy to apply in violent situations	0.59	0.55	3.09 (1.01)	3.09 (1.01)	3	3
4. I am satisfied with the current method of how the ASDS trainings are provided	0.77	0.65	2.88 (1.12)	2.88 (1.12)	3	4
5. I am satisfied with the frequency of ASDS trainings	0.67	0.47	2.13 (1.25)	2.13 (1.25)	2	1
6. The frequency of ASDS trainings is sufficient to adequately apply ASDS in violent situations	0.64	0.49	2.22 (1.20)	2.22 (1.20)	2	1
Mean: Satisfied with ASDS preparation				**2.69 (0.80)**		
ASDS use						
7. During violent situations, I am able to apply the suitable ASDS	0.53	0.47	2.91 (1.03)	2.91 (1.03)	3	3
8. During violent situations, my skill execution is different than during ASDS training	0.58	0.37	3.58 (0.94)	2.42 (0.94)*	4	4
9.During violent situations, I also apply alternative skills than just the taught ASDS	0.75	0.45	3.66 (0.93)	2.34 (0.92)*	4	4
10. During violent situations, I only apply the taught ASDS	0.67	0.53	2.25 (1.00)	2.25 (1.00)	2	2
11. During violent situations, I am able to perform effectively without applying the taught ASDS	0.57	0.42	3.39 (1.10)	2.61 (1.10)*	3	4
Mean: Use of regular ASDS				**2.51 (0.67)**		
Overuse of legal force						
12. After a violent situation, I have the feeling that I applied legal force too early	0.83	0.51	1.80 (0.73)	1.80 (0.73)	2	2
13. After a violent situation, I have the feeling that I applied more legal force than necessary	0.83	0.51	1.92 (0.81)	1.92 (0.81)	2	2
Mean: Overuse of legal force				**1.86 (0.67)**		
Underuse of legal force						
14. After a violent situation, I have the feeling that I applied legal force too late	0.76	0.43	2.61 (1.02)	2.61 (1.02)	3	2
15. After a violent situation, I have the feeling that I applied less legal force than necessary	0.86	0.43	2.66 (0.95)	2.66 (0.95)	3	3
Mean: Underuse of legal force				**2.63 (0.84)**		
Problems with skill execution						
16. After a violent situation, I have the feeling that I applied the wrong skills	0.78	0.55	2.08 (0.87)	2.08 (0.87)	2	2
17. After a violent situation, I have the feeling that I should have executed the skills better	0.79	0.55	2.50 (1.02)	2.50 (1.02)	2	3
Mean: having problems with skill execution				**2.29 (0.83)**		
Performance Effectiveness						
18. During violent situations, I am able to perform effectively	0.74	0.57	3.79 (0.73)	3.79 (0.73)	4	4
19. During violent situations, I know what I am doing	0.71	0.51	3.89 (0.79)	3.89 (0.79)	4	4
20. During violence situations, I experience problems	0.66	0.43	2.08 (0.84)	3.92 (0.84)*	2	2
21. When the chance of violence is likely, I rather avoid the situation	0.71	0.48	2.20 (1.07)	3.80 (1.07)*	2	2
Mean: Performance effectiveness				**3.85 (0.62)**		
More frequent and more realistic training						
22. In case of more ASDS training, I will experience less anxiety during police work	0.81	0.75	3.19 (1.22)	3.19 (1.22)	3	4
23. In case of more ASDS trainings, my ASDS performance in violent situations will improve	0.83	0.70	3.63 (1.11)	3.63 (1.11)	4	4
24. If training sessions become more reality-based, I will experience less anxiety during police work	0.80	0.74	3.60 (1.17)	3.60 (1.17)	4	4
25. If training sessions become more reality-based, my ASDS performance in violent situations will improve	0.80	0.69	4.06 (1.01)	4.06 (1.01)	4	5
Mean: Expect to experience less anxiety and to perform better with more frequent and more realistic training				**3.62 (0.95)**		

*recoded scores

Descriptive statistics

ASDS preparation. Officers reported average scores varying from 2.64 to 3.30 about the usefulness of the taught skills (Table 2.2, Item 1 to 3). Altogether, with average scores around 3, and the medians and modes of 3 (and one 4), it seems that on average, officers are neither positive nor negative about the usefulness of the taught skills. Furthermore, officers answers concerning whether they are satisfied with the current method of how the ASDS training is provided show some ambiguity (Item 4, *M* = 2.88, *Median* = 3, *Mode* = 4). Although the mode implies that most officers agree with this statement, the median and average score imply that officers are divided concerning their satisfaction towards the current method of ASDS training. Finally, officers reported that they are unsatisfied with the frequency of training sessions (Item 5, *M* = 2.13, *Median* = 2, *Mode* = 1; Item 6, *M* = 2.22, *Median* = 2, *Mode* = 1).

ASDS use. Officers were neutral about whether they are able to apply the most suitable ASDS (Item 7, *M* = 2.91, *Median* = 3, *Mode* = 3), and reported that their execution in the line of duty is generally different than during training (Item 8, *M* = 3.58, *Median* = 4, *Mode* = 4). They further reported that they frequently apply alternative skills (Item 9, *M* = 3.66, *Median* = 4, *Mode* = 4) instead of the taught ASDS (Item 10, *M* = 2.25, *Median* = 2, *Mode* = 2). In addition, most officers indicated that they are able to perform effectively without applying the taught ASDS, although on average, officers reported a score closer to 3 than 4, indicating some diversity concerning this item (Item 11, *M* = 3.39, *Median* = 3, *Mode* = 4).

Overuse of legal force. Officers reported that after violent situations, they do not have the feeling that they applied legal force too early (Item 12, *M* = 1.80, *Median* = 2, *Mode* = 2) or more than necessary (Item 13, *M* = 1.92, *Median* = 2, *Mode* = 2).

Underuse of legal force. On average, officers reported that they are neutral on the feeling that they applied legal force too late (Item 14, *M* = 2.66, *Median* = 3, *Mode* = 2) or more than necessary (Item 15, *M* = 2.61, *Median* = 3, *Mode* = 3), indicating that they have no strong tendency to apply legal force too late or less than necessary.

Problems with skill execution. On average, officers scored between 2 and 3 on the feeling that they applied the wrong skills (Item 16, *M* = 2.08, *Median* = 2, *Mode* = 2) and that they should have executed the skills better (Item 17, *M* = 2.50, *Median* = 2, *Mode* = 3). Thus overall, officers indicated that they do not have many problems executing their skills.

Performance effectiveness. Officers reported that they are able to perform effectively in violent situations (Item 18, *M* = 3.79, *Median* = 4, *Mode* = 4), and that they know what they are doing (Item 19, *M* = 3.89, *Median* = 4, *Mode* = 4). They further indicated that they hardly experience problems during violent situations (Item 20, *M* = 2.08, *Median* = 2, *Mode* = 2) and that – overall – they have no tendency to avoid violent situations (Item 21, *M* = 2.20, *Median* = 2, *Mode* = 2).

More frequent and more realistic training. Most officers indicated that anxiety would decrease if they would receive more training sessions, although on average, officers reported a score closer to 3 than 4, indicating some diversity concerning this item (Item 22, *M* = 3.19, *Median* = 3, *Mode* = 4). They were more positive towards the suggestion that feelings of anxiety would decrease if they would receive more reality-based training sessions (Item 23, *M* = 3.60, *Median* = 4, *Mode* = 4). They further indicated that they expect that their performance would benefit from more frequent (Item 24, *M* = 3.63, *Median* = 4, *Mode* = 4) and more reality-based training (Item 25, *M* = 4.06, *Median* = 4, *Mode* = 5).

Open question. 489 of the 922 respondents answered the question about how ASDS preparation could be improved. A total of 735 suggestions were provided. These suggestions were categorized into the following categories: (1) 'reality-based training', including suggestions concerning the type of training, situations, and locations; (2) 'more training', including suggestions concerning the frequency of training sessions; (3) 'learning alternative techniques', including suggestions concerning the type of skills that are taught; and (4) 'other answers'. A reliability check by repeating the same procedure for statements of fifty respondents showed a percentage of error between two raters of only 4.5%, indicating that categorization was reliable (Hughes et al., 2004). Results showed that 40.0% of the suggestions to improve ASDS preparation were related to 'reality-based training', 29.5% to 'more training', and 18.1% to 'learning alternative techniques'. 12.4% of the suggestions were classified into the category 'other answers'.

Correlations

Experience with violence. There were significant negative correlations between 'experience with violence' and: 'ASDS preparation', 'ASDS use', and 'problems with skill execution' (Table 2.3). In addition, there was a positive correlation between 'experience with violence' and 'performance effectiveness'. Thus, officers with more experience with violence reported that they are more negative towards the regular ASDS preparation, make less use of regular ASDS, experience fewer problems with skill execution and perform more effectively in violent situation (see also Figure 2.1: for experience with violence, scores of 1 and 2 are taken together and presented as 'sometimes', scores of 3 as 'regularly' and scores of 4 and 5 as 'often').

Table 2.3. Correlations between experience with violence, experience with martial arts, anxiety and construct means. 1-9 across the top equal 1-9 reported in the first column.

	1	2	3	4	5	6	7	8	9
1. Experience with violence									
2. Experience with martial arts	.091**								
3. Anxiety	-.009	-.04							
4. ASDS preparation	-.085*	-.146***	-.041						
5. ASDS use	-.135***	-.213***	.014	.528***					
6. Problems with skill execution	-.092**	-.154***	.182***	.041	.175***				
7. Performance effectiveness	.269***	.222***	-.241***	.018	-.085*	-.402***			
8. Overuse of legal force	-.031	.013	.135***	.028	.044	.271***	-.280***		
9. Underuse of legal force	-.044	-.042	.200***	-.048	-.011	.295***	-.303***	.199***	
10. More frequent and more realistic training	.026	.069	.190***	-.047	.223***	.261***	-.102**	.069*	.191***

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

Experience with martial arts. There were negative correlations between 'experience with martial arts' and: 'ASDS preparation', 'ASDS use' and 'problems with skill execution'. In addition, there was a positive correlation between 'experience with martial arts' and 'performance effectiveness'. Thus, officers with more experience with martial arts reported that they are more negative about the regular ASDS preparation, make less use of regular ASDS, experience fewer problems with skill execution and perform more effectively in violent situations (see also Figure 2.2).

Anxiety. There were positive correlations between 'anxiety' and: 'overuse of legal force', 'underuse of legal force', 'problems with skill execution' and 'more frequent and more realistic training'. In addition, there was a negative correlation between 'anxiety' and 'performance effectiveness'. Thus, officers who experience anxiety more often reported that they more often have the feeling that they applied the incorrect degree of force. They also reported that they experience more problems with skill execution and perform less effectively in violent situations. Furthermore, officers who experienced anxiety more often reported that they expect to benefit more from more frequent and more realistic training (see also Figure 2.3: for anxiety, scores of 1 and 2 are taken together and presented as 'sometimes', scores of 3 as 'regularly' and scores of 4 and 5 as 'often').

Additional correlations. There was a positive correlation between 'ASDS preparation' and 'ASDS use'. Officers who are more positive towards ASDS preparation report that they apply them more often. In addition, there was a negative correlation between 'ASDS use' and 'performance effectiveness' and there were positive correlations between 'ASDS use' and: 'problems with skill execution' and 'more frequent and more realistic training'. Thus, officers who make more use of ASDS (as opposed to alternative skills) reported that they experience more problems with skill execution, perform less effectively and expect to benefit from more frequent and more realistic training. 'Problems with skill execution' and 'performance effectiveness' were negatively correlated. Furthermore, 'problems with skill execution' was positively and 'performance effectiveness' was negatively correlated with: 'overuse of legal force', 'underuse of legal force' and 'more

frequent and more realistic training'. Finally, 'overuse of legal force' and 'underuse of legal force' were positively correlated and both variables were positively correlated with 'more frequent and more realistic training'. Thus, officers who report to overuse or underuse force in the line of duty, reported that they expect to benefit more from more frequent and more realistic training.

Regression analyses

Anxiety. The included variables 'experience with violence', 'experience with martial arts', 'gender' and 'age', did not predict any of the variance regarding 'anxiety', with $F(5,858) = 0.65$, $p = .66$.

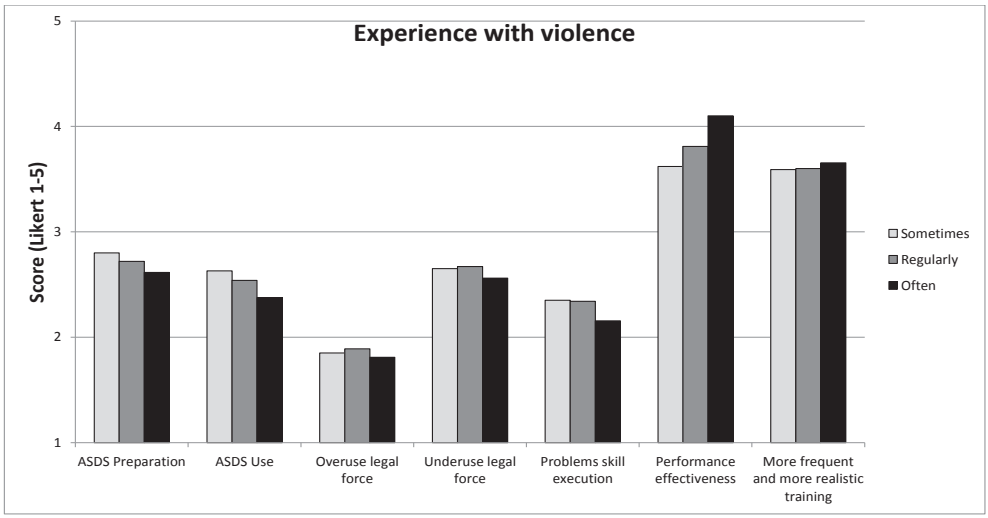

Figure 2.1. Construct means as a function of experience with violence.

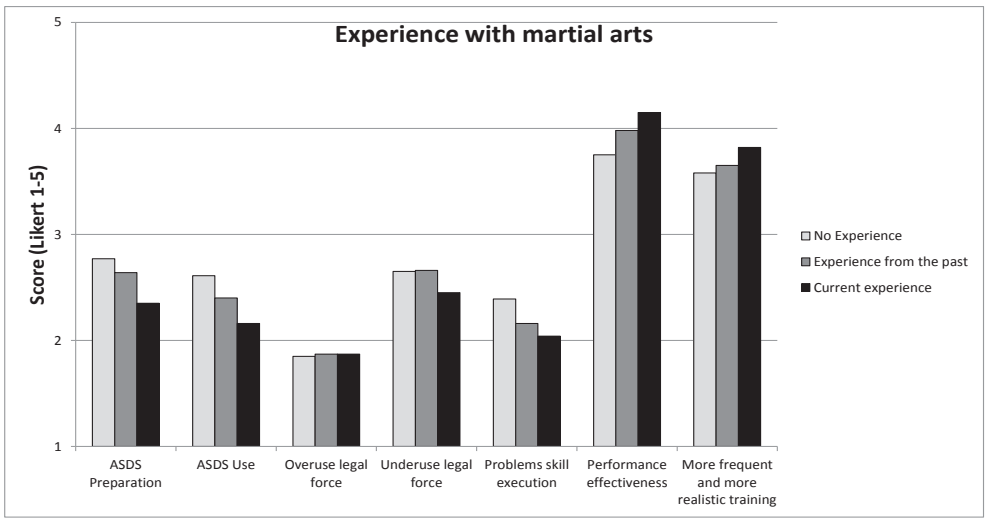

Figure 2.2. Construct means as a function of experience with martial arts.

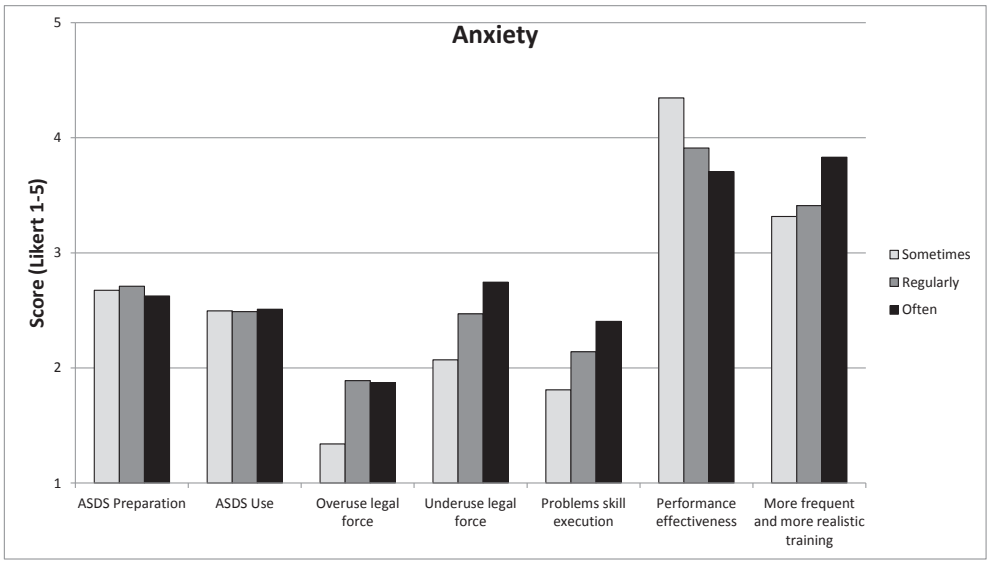

Figure 2.3. Construct means as a function of how often officers experienced anxiety.

Performance effectiveness. The included variables, 'experience with violence', 'experience with martial arts', 'anxiety', 'gender' and 'age', accounted in total for 20% of the variance regarding 'performance effectiveness', $F(6,856) = 34.83$, $p < .001$, $f^2 = .25$ (Table 2.4). Experience of officers accounted for 11% of the variance, anxiety of officers for 5% and officers' characteristics (age and gender) for the remaining 4%. As illustrated in Table 2.4, the regression coefficient (*B*) of 'experience with violence' was .17, which indicates that for each increase of 1 on the Likert scale, the performance effectiveness score (1-5) increased by .17. In cases where officers had previous experience in martial arts, performance effectiveness score increased by .16 and by .29 if they had present experience in martial arts. The regression coefficient of 'anxiety' was -.17, which indicates that for each increase of 1 on the Likert scale, the performance effectiveness score decreased by .17. In comparison to their male colleagues, female officers' performance effectiveness score was .21 lower. Finally, the regression coefficient of 'age' was -.01, which indicates that for each increase of 1 year, the performance effectiveness score decreased by .01. Thus, officers with additional experience perceive their performance effectiveness as higher than officers with no additional experience. Anxiety and age have a negative influence on perceived performance effectiveness. Finally, female officers perceive their performance effectiveness as lower than male officers.

Table 2.4. Summary of hierarchical regression analysis for predicting whether officers are able to perform effectively during violent situations.

Variable	*B*	SE *B*	*β*	*F*	*t*	Sig.	R^2	ΔR^2
Step 1				35.90		.00	.11	.11
Violence	.17	.02	.24		7.79	.00		
Martial arts: past	.16	.04	.12		3.72	.00		
Martial arts: present	.29	.07	.13		4.13	.00		
Step 2				42.10		.00	.16	.05
Anxiety	-.17	.02	-.22		-7.26	.00		
Step 3				34.83		.00	.20	.04
Gender	-.21	.05	-.13		-3.96	.00		
Age	-.01	.00	-.17		-5.18	.00		

General discussion

The current study investigated Dutch police officers' perceptions of their preparation and performance of arrest and self-defence skills. We further explored whether additional experience (on duty or martial arts) and anxiety influence these perceptions.

General perceptions

Our first aim was to investigate how well officers feel prepared and able to manage violence on duty. Given the limited number of training hours and the indications that officers seem critical towards their training (Witzier, 2006), we expected officers to be critical towards their preparation, especially towards the number of training hours. Still, because officers are educated to perform at a certain level, we expected them to feel able to perform sufficiently in violent situations. Our results mostly confirm these hypotheses. Officers indeed felt that the current amount of training is too low, which was also confirmed by the open answers about how ASDS preparation could be improved: 29.5% of the answers indicated a wish for more training. In addition, officers indicated that they expect that their performance would benefit from more frequent training. Officers seemed neither clearly positive nor clearly negative about the usefulness of the ASDS. Still, officers reported that they regularly apply alternative skills instead of the regular ASDS. Whether this is the case because officers simply did not train enough to master these skills or because the skills are only moderately usable is not clear. However, 17% of the answers to the open question indicated a wish for learning additional techniques which implies that the current set of ASDS is perceived as not entirely sufficient to deal with violence on duty. In addition, officers who more often use the ASDS reported lower performance effectiveness. Concerning how ASDS training is provided, officers seemed a bit more positive. Still, 40% of the answers to the open question indicated a wish for more realistic training, and officers indicated that they

expect that their performance would benefit from more reality-based training. Thus it seems that officers are not dissatisfied with the current method, but that receiving more realistic training would appear more beneficial to them.

Although these results indicate that several forms of improvement are warranted, officers did indicate that they: were generally able to apply the correct degree of legal force, do not have many problems with skill execution and thus, perform sufficiently effectively in violent situations. The limited objective information that is available about actual ASDS use on duty confirm our results (Timmer, 2005). Naeyé (2005) found that in 10% of the reported cases with violence, one or more officers got injured. Concerning overuse of violence by police officers, Timmer (2005) found that, on average, Dutch Public Prosecution judges 13% of the cases of the use of police force as unjustified. Thus, although officers seem generally able to perform effectively and use force proportionally, there appears to be substantial room for improvement. In fact, longitudinal data shows that the number of injured officers in 2005 was almost four times higher than in 1975 (Timmer, 2007).

Additional experience

Our second aim was to explore whether and how additional experience influences how officers feel prepared and able to manage violence on duty. Based on the limited number of training hours that officers receive, we expected more experienced officers to be more positive about their performance effectiveness than less experienced officers. In addition, we expected that more experienced officers would report applying alternative skills (instead of the taught ASDS) more often than less experienced officers. Our results confirmed these hypotheses. First, more experienced officers reported better skill execution and performance effectiveness than less experienced officers. Second, more experienced officers more often applied alternative skills (other than the taught ASDS). Whether this is the case because officers with martial arts experience train their combat skills more than their ASDS skills and therefore rely more on this type of skills is not clear. Officers with more experience with violence (and not necessarily with martial arts) also reported that they apply alternative skills more often. Furthermore, more experienced officers reported that they are less satisfied with the current range of ASDS than less experienced officers. These results are another indication that the current ASDS may have moderate usefulness on duty.

Anxiety

Our third aim was to explore whether and how anxiety influences how officers feel prepared and able to manage violence on duty. Based on experimental studies that investigated effects of threat and anxiety on police officers' execution professional skills (i.e., arrest and self-defence, shooting; Renden et al., 2014; Nieuwenhuys & Oudejans, 2010), we expected that anxiety would negatively affect officers' perceived performance

effectiveness. Our results confirm this hypothesis. Officers who more often experienced anxiety reported lower scores on applying the correct degree of legal force, on skill execution, and on performance effectiveness. Thus, findings from this questionnaire with a large and representative sample of officers confirm earlier experimental findings with smaller samples (e.g., Nieuwenhuys & Oudejans, 2010), showing that anxiety negatively affects police performance. Note that we also found that anxiety is experienced among all officers, regardless of experience, gender or age. In addition, officers who experienced anxiety more often expect to benefit from more frequent and more realistic training.

Recommendations and conclusions

Our results indicate that improvements in police training are warranted, for instance, to decrease the number of injured officers or the number of cases that are labelled as unjustified police force. Our hierarchical multiple regression analyses showed that increasing officers' experience is the largest potential contributor in increasing performance effectiveness on duty. Further, anxiety was shown to be the largest negative contributor of performance effectiveness. Finally, it appeared that gender and age play a role in performance effectiveness. Future research is needed to investigate how the latter affects police performance. Thus, ASDS preparation could be improved by increasing experience and by creating the experience of anxiety. Our results indicate three possible variables to improve police training: (a) frequency of training (experience), (b) realistic training (anxiety), and (c) usefulness of ASDS (anxiety).

Recommendations for ASDS training

First, officers could receive more training, to increase their experience. Literature on deliberate practice makes clear that it takes many hours of practice to become an expert (e.g., Ericsson, 2014) and to learn to execute a skill automatically (cf. Bernstein, 1996; Beilock & Carr, 2001). During police work, automatic execution would enable officers to act quickly and to leave attention free to deal with situational demands such as high pressure.

Second, officers could receive more realistic training, to specifically improve performance under high levels of pressure and anxiety (Nieuwenhuys & Oudejans, 2011). Several studies have found that how individuals train is crucial in skill acquisition (e.g., Duke et al., 2009; Van Rossum, 2000; Ward et al., 2007). Future research is needed to determine whether such training would lead to similar, positive effects for ASDS in high-pressure circumstances (see also Oudejans, 2008; Oudejans & Pijpers, 2009, 2010 for positive effects of training under pressure).

Third, officers could learn techniques that are more effective in violent situations, and easier to apply under pressure, so that skills that are practiced are also used more

consistently on duty.[3] Officers with more experience with violence, but not necessarily with martial arts, reported that they apply the taught ASDS less often and, instead, relied more on alternative skills. Therefore, it may be better to teach officers more basic reflex-like self-defence moves (see Bernstein, 1996; Beek, 2000, for a theoretical account supporting this suggestion). Whether such skills are better learned in little time and usable for police officers (under pressure) remains to be determined.

Limitations

There were several limitations to this study. First, with respect to the interpretation of our findings, it is important to note that the current study used a questionnaire asking for officers perceptions of their ASDS preparation and performance. As such, we did not determine, for example, actual 'experience with violence', 'ASDS use', 'performance effectiveness'. Although we expect that officers truthfully answered the questions, we do not know whether police officers perceptions fully match reality. Still, our results are in line with experimental studies concerning skill acquisition (e.g., Ericsson et al., 1993) and performing and training under pressure (e.g., Nieuwenhuys & Oudejans, 2011; Renden et al., 2014).

Second, this study investigated officers' experiences concerning their general ASDS performance on duty. Consequently, it is not possible to draw conclusions on specific skills (e.g., fighting techniques, handcuffing). Further, it is not possible to discriminate between several aspects of police work such as execution of motor skills, communication, and posture. Future work is needed to provide more detailed insights into the relationships between police officers' experience, anxiety, and performance on different (aspects of) arrest- and self-defence skills.

Conclusions

Our results showed that having additional experience was associated with better performance. Officers who experienced anxiety more often, on the other hand, reported more problems. Although most officers report sufficiently effective performance, they, especially those with additional experience, feel that training frequency is too low and they reported that the currently taught ASDS are only moderately useful (at least with the current amount of training). As such, ASDS training may need reconsideration. First, officers' experience would increase when they receive more training sessions. Second, quality of training is likely to improve when they are more comparable to the high-pressure situations that officers face in the line of duty (including realistic scenarios with actors, threat of pain [e.g., electrical knife; Renden et al., 2014]). Third, the currently used skills seem to be only moderately useful (at least with the current

3 *The techniques we refer to are fight and control techniques. Handcuffing, also part of the ASDS, is a specific police skill and is mostly performed when officers have gained control over the suspect.*

amount of training) in the line of duty. We suggest to consider teaching officers more basic reflex-like skills that may be easier to learn and execute in real-life situations. These suggestions could help to further improve police performance and reduce risk of injury.

CHAPTER 3

Effects of anxiety on the execution of police arrest and self-defence skills

Renden, P.G., Landman, A., Geerts, S.F., Jansen, S.E.M., Faber, G.S., Savelsbergh, G.J.P., & Oudejans, R.R.D. (2014). Effects of anxiety on the execution of police arrest and self-defence skills. *Anxiety, Stress, & Coping*, 27, 100-112. DOI: 10.1080/10615806.2013.810213.

Abstract

We investigated the effects of anxiety on the execution of police officers' arrest and self-defence skills. Police officers (n = 13) performed three tasks in which they kicked, blocked, or restrained an opponent who attacked them with a rubber knife (low-anxiety) or a shock knife (high-anxiety) in a within-subject design. We analyzed performance (on a 5-point Likert scale), movement times, posture, and movement velocity and acceleration. Results revealed that performance was worse in the HA compared to the LA condition. Furthermore, analysis of full-body movement showed that under increased anxiety, police officers' performance contained characteristics of avoidance behaviour, such as faster reactions (to reduce the time being exposed to the threat), leaning further backwards (kick) and ducking down (block). In line with recent theoretical developments, it appears that under increased anxiety, police officers were less able to inhibit stimulus-driven processing (fear of getting hit) and enforce goal-directed processing (perform the skill as well as possible) leading to avoidance behaviour and a decrease in performance.

Key Words: Attentional control theory; Avoidance behaviour; Choking; Perceptual-motor performance; Pressure; Threat

Introduction

In many professions, people have to perform perceptual-motor skills in high-pressure situations. Think, for example, of basketball players taking decisive free throws, surgeons performing life saving operations, or police officers defending themselves against aggressive assailants (e.g., Nieuwenhuys, Caljouw, Leijsen, Schmeits, & Oudejans, 2009; Oudejans & Pijpers, 2009; Wilson, McGrath, Vine, Brewer, Defriend, & Masters, 2010). In such situations, pressure-induced state-anxiety may lead to a performance decrease at the moment when one's best performance is needed. Anxiety can be defined as ''an aversive emotional and motivational state in threatening circumstances'' (Eysenck, Derakshan, Santos, & Calvo, 2007, p. 336), and is ''related to the subjective evaluation of a situation, and concerns jeopardy to one's self-esteem during performance or social situations, physical danger, or insecurity and uncertainty'' (Schwenkmezger & Steffgen, 1989, p. 78, 79). During police work, officers occasionally experience state-anxiety (e.g., Anderson, Litzenberger, & Plecas, 2002), and any resulting decrease in performance may be devastating as there is extensive risk of physical injury or even death. Therefore, investigating perceptual-motor behaviour of police officers in high-pressure situations is of particular relevance.

Several studies have reported that police officers' handgun shooting performance decreases when officers perform in high-anxiety conditions in which they are shot at by an opponent (using coloured soap cartridges) (Nieuwenhuys & Oudejans, 2010, 2011; Oudejans, 2008). These performance drops can be explained by Nieuwenhuys and Oudejans' (2012) integrated model of anxiety and perceptual-motor performance, which is largely based on a recently endorsed theory on anxiety and cognitive performance known as attentional control theory (ACT; Eysenck, Derakshan, Santos, & Calvo, 2007). When anxiety levels are high, it is harder to pay attention to goal-directed information as attention is drawn to threat-related sources of information that are irrelevant for executing the task. In addition, it is also harder to inhibit avoidance tendencies that cause individuals to make more executive mistakes when approach behaviour is required to execute the task. For example, during a handgun shooting experiment, anxious police officers ducked down (in order to decrease the chance of getting hit) and turned away from the opponent (the target) during reloading (Nieuwenhuys & Oudejans, 2010). Apparently, officers' attention was distracted by the risk of getting hit. As a result, they were less able to pick up task-relevant information. In addition, police officers rushed their performance in an attempt to reduce the time they could possibly get shot (as they reported after the experiment). Thus, their emotional state was incongruent with goal-directed behaviour (taking sufficient time to take their shot) resulting in lower shot accuracy.

Nieuwenhuys et al. (2009) also investigated the influence of anxiety on the performance of arrest and self-defence skills (ASDS). They first developed a performance scale, which gave police instructors the possibility to quantify the officers' performance of ASDS on

a 5-point Likert scale. In the low-anxiety condition, the police officers executed ASDS by contacting a foam strike shield. In the high-anxiety condition, they executed the same skills on an opponent who looked and behaved threateningly. Nieuwenhuys et al. found that the police officers' performance of most assessed ASDS decreased in the high-anxiety condition compared to the low-anxiety condition. However, the opponent's physical behaviour (walking around and pushing the police officers occasionally) may also have influenced performance. Furthermore, the assessment of performance did not give insight into why performance was worse in the high-anxiety condition.

In the present study, we aimed to replicate and expand the findings of Nieuwenhuys et al. (2009). On top of behavioural observations, we also investigated whether (and how) kinematics of ASDS differ between conditions in which police officers are less and more anxious. Analyses of bodily kinematics do not only provide a more objective assessment of performance but they may also offer an explanation of why and how anxiety affects performance (Beuter & Duda, 1985; Weinberg & Hunt, 1976). We were particularly interested in whether bodily kinematics would show characteristics of the avoidance behaviour as previously reported in handgun shooting experiments (e.g., Nieuwenhuys & Oudejans, 2010).

Police officers in the present study performed three self-defence techniques against a knife attack by an opponent: a push kick, a knife block, and a wristlock technique (Figure 3.1). The officers performed these techniques under high and low anxiety conditions. We expected performance to be worse in the high anxiety condition (Nieuwenhuys et al., 2009). In addition, based on the model by Nieuwenhuys and Oudejans (2012; see also Eysenck et al., 2007) and the findings by Nieuwenhuys and Oudejans (2010), we predicted that threat-focused attention and incongruent motivational response tendencies (avoidance) would result in changed posture (such as ducking down) to establish a larger distance between the body and the threat (knife) and faster responses to decrease the time being exposed to the threat.

Figure 3.1. Top: performance of a push kick; middle: performance of a knife block; bottom: performance of a wristlock.

Method

Participants

Thirteen police officers (10 men, 3 women) with a mean age of 33.9 years (*SD* = 8.2) participated in this study. On average, the police officers had 10.1 years (*SD* = 6.7) of working experience. A certified police instructor acted as the opponent of the participants. He was experienced in teaching, training and role-playing. Participants' trait anxiety scores (*M* = 30.23, *SD* = 5.69; Spielberger State-Trait Anxiety Inventory [STAI]

A-Trait Scale) were significantly lower than the norm (i.e., 36.7; $t = 2.58$; $p = .01$; Van der Ploeg, Defares, & Spielberger, 1980) indicating that the participants had no extraordinary general tendency to respond to threatening situations with an elevation in state anxiety. Participants provided written informed consent prior to participation, and the experiment was approved by the ethics committee of the research institute.

Tasks and conditions

Tasks. Each participant performed the three tasks (push kick, knife block and wristlock, see Figure 3.1) in a low- (LA) and high-anxiety (HA) condition. To create a clear distinction between these conditions, all three tasks were first executed in one condition and then in the other. In each condition, four kicks, four knife blocks and three wristlocks were performed. The order of the conditions and the skills within conditions were counterbalanced.

During the kick and the knife block trials, the opponent came forward with an overhead knife attack (video analyses showed attacking velocity was not different between conditions, $t(12) = .88$, $p = .40$, $t(12) = .92$, $p = .38$) and the participants either kicked the opponent away or blocked the knife attack (Figure 3.1). For the wristlock, a knife attack was not suitable. Instead, the participants were instructed to grab and control the opponent. The opponent approached them, pushed them away and reached for the knife lying on the floor (Figure 3.1). To prevent the opponent from getting to the knife, participants performed a wristlock.

Conditions. In the LA condition, the opponent used a harmless rubber training knife (length: 295 mm). Furthermore, he did not appear threatening and he remained quiet during the trials. In the HA condition, the opponent used an electrical knife (Shocknife®; length: 283 mm) that could deliver a painful shock (7,500 V but less than 1 mA) and, thus, was expected to create a more threatening experience for the participants. Participants were instructed that they risked getting hit if they performed poorly. In reality, the opponent made sure that he never hit the participants with the knife. Furthermore, the opponent wore a black mask and behaved threateningly. He aimed to threaten and intimidate the participant throughout the condition.

Experimental setup

Participants were instructed to take position behind their starting line which was placed 1.70 m from a corner that was constructed with two large screens. The opponent, wearing foam body armour, started from another line facing the participants. For the kick and wristlock this line was 1.50 m away from the participants' line. For the knife block this line was 1.00 m away, because for this technique the opponent had to be closer to the participants. Three video cameras (Panasonic WV-CP150 Super Dynamic™, Panasonic Corporation, Japan, 25 Hz, 768 x 492 pixels) were placed around the setup: two

perpendicular (one on each side, 1.00 m above the ground) to the opponent's walking direction and one was attached to the ceiling (5.00 m above the ground).

Materials and measures

Manipulation check. To analyse the effect of our anxiety manipulation, we assessed participants' subjective ratings of anxiety and mental effort (in each condition) by using two distinctive visual-analogue scales: an anxiety scale (i.e. 'the anxiety thermometer', Houtman & Bakker, 1989) and the Rating Scale for Mental Effort [RSME] (Zijlstra, 1993). Both scales have good psychometric properties and were successfully used in earlier experiments (e.g., Nieuwenhuys et al., 2009). Heart rate was registered using a Polar heart rate monitor.

Performance. To measure performance, we used the 5-point Likert scale that was also used with ASDS by Nieuwenhuys et al. (2009). Nieuwenhuys et al. reported satisfactory inter-rater reliability (.67) and intra-rater reliability (.77) and external and concurrent validity to be good. In addition, for the push kick, the distance the opponent was kicked away was determined by using video analysis. We calculated the distance between the position of the opponent's right shoulder at the moment of impact of the participant's foot and at the moment the opponent's backwards movement stopped.

Movement variables. Participants wore a Lycra suit equipped with 17 sensory modules containing accelerometers that measure three-dimensional data of 23 body segments and 22 joints (Xsens MVN motion capture, 120 Hz, Enschede, the Netherlands – see Cutti , Ferrari, Garofalo, Raggi, Cappello, & Ferrari, 2010; Supej, 2010 for validation check). Using the Xsens software, output data consisted of position data with respect to an Earth-fixed reference coordinate system. A stick figure of the participant was constructed in MATLAB (7.14.0, The MathWorks Inc., Natick, MA, 2010), which was used to determine several key moments of movement. For the kick, we determined the onset of the kick (when the heel of the kicking foot left the ground) and first and last contact of the kicking foot on the opponent's body. For the knife block, we determined the onset of the block (first visible change in posture from starting position) and the moment the participant's arm made contact with the opponent's arm. For the wristlock, we determined the end position when the participant's hands were placed stable on the opponent's hand.

The opponent's movements were not recorded by the Xsens system. Therefore, video footage was used to determine the following key moments: for the push kick and the knife block, the start of the opponent's knife attack (first visible change in posture from starting position), and for the wristlock, the end of the opponent's push (hands detached from the participant) and the moment the participant grabbed the opponent (both hands made contact with the opponent's arm).

Several movement variables were selected for further analysis (for a full overview, see Table 3.1). Durations between key moments were set as reaction and movement times. Movement kinematics were analyzed in the sagittal plane with movement in

x-direction defined as forward and movement in y-direction as upward. Velocity and acceleration variables of the knife block were analyzed in three dimensions. For the push kick, we were interested in the distance (x-direction) between the neck and the standing foot sensor at kick onset and first contact foot. This variable, expressed as leaning backwards, would give us insight into whether participants showed avoidance behaviour (leaned further backwards) with increased anxiety. The same holds for the knife block, but for that task, we were interested in the height (y-direction) between the neck and the standing foot sensor and the height of the blocking arm at contact. These variables, expressed as standing height and blocking height, would also give insight into whether participants showed avoidance behaviour (duck down, block low) rather than goal-directed behaviour (stand tall, block high) with increased anxiety. For the push kick, we calculated peak velocity and peak acceleration between kick onset and first contact, and between first and last contact (the lower leg, x-direction). For the knife block, we calculated these variables between block onset and contact (both arms, three dimensional). Data analysis for the wristlock showed that posture, velocity and acceleration variables were not comparable because the task can be executed correctly in many ways.

Procedure

At the start of the experiment participants were briefed about the test, they provided informed consent and completed the STAI. Next, participants put on the Lycra suit and their body length, arm span, hip height and foot size were measured. The motion capture system was calibrated using this information to determine sensor-to-body alignment and body dimensions. A brief warm-up was done under supervision of the opponent before the measurements started. Then, the participants received instructions about the tasks and were asked to take position behind the starting line. After two practice trials, the first condition started. When the three or four trials (depending on the task) were finished, the opponent rated the participants' performance per trial and the participants rated their perceived anxiety and mental effort. Then the next task started in which the procedure was repeated. When the trials for all three tasks were finished, the next condition started with the first task.

Data analysis

Two-tailed paired *t*-tests were performed to assess the effects of condition (LA, HA) on anxiety scores, mental effort, heart rate, performance scores and distance the opponent was kicked away. Effect sizes were calculated using Cohen's *d* with 0.20 or less, about 0.50, and 0.80 or more, representing small, moderate, and large effects, respectively (Cohen, 1988). Repeated measures multivariate analyses of variance (MANOVA) were performed to examine the effects of condition on movement times, posture variables, velocity variables and acceleration variables. Significant multivariate effects were fol-

lowed by separate univariate ANOVAs for each variable. Effect sizes were calculated as partial eta-squared values (η_p^2).

Table 3.1. Mean values (and standard deviations) for movement times, posture and velocity and acceleration variables in low- and high-anxiety conditions.

Variable	Description	Low-anxiety	High-anxiety
Movement times (ms)			
Push kick			
Reaction time	Start attack to kick onset	513 (117)	340 (183)**
Aim-and-accelerate phase	Onset kick to first contact	294 (35)	291 (31)
Push phase	First to last contact	128 (65)	116 (78)
Knife block			
Reaction time	Start attack to kick onset	367 (168)	285 (129)*
Block phase	Block onset to contact	645 (195)	640 (117)
Wristlock			
Grab phase	End of push to contact	928 (236)	870 (524)
Control phase	Contact to end position	919 (285)	1,227 (569)
Ratio between grab and control phase	Grab phase / control phase	1.05 (0.40)	1.74 (1.24)*
Posture variables (cm)			
Push kick			
Leaning backwards at kick onset	Horizontal distance neck-foot	7.33 (7.44)	12.50 (9.87)*
Leaning backwards at first contact	Horizontal distance neck-foot	2.80 (9.18)	4.80 (9.16)+
Knife block			
Standing height	Height neck-foot	136.04 (6.76)	130.70 (7.53)*
Blocking height	Height blocking arm	179.67 (10.32)	167.98 (18.92)*
Velocity and acceleration variables			
Push kick			
Peak velocity before contact (m/s)	Kick onset to first contact	5.79 (.73)	6.14 (.73)**
Peak velocity during contact (m/s)	First contact to last contact	2.81 (1.45)	3.34 (1.15)
Peak acceleration before contact (m/s^2)	Kick onset to first contact	56.99 (17.62)	58.39 (15.00)
Peak acceleration during contact (m/s^2)	First contact to last contact	31.18 (21.00)	36.44 (19.96)
Knife block			
Peak velocity left arm (m/s)	Block onset to contact	5.57 (1.21)	5.75 (2.01)
Peak velocity right arm (m/s)	Block onset to contact	4.28 (1.53)	3.76 (1.51)
Peak acceleration left arm (m/s^2)	Block onset to contact	33.80 (16.34)	31.39 (11.75)
Peak acceleration right arm (m/s^2)	Block onset to contact	19.38 (10.70)	18.18 (11.53)

* $p < .05$, ** $p < .01$, + $p = .08$

Results

Manipulation check

For all three tasks, participants reported significantly higher levels of anxiety and perceived mental effort in the HA condition than in the LA condition (Table 3.2). Average heart rate was also significantly higher in the HA condition for the push kick and the

knife block, but it just failed to reach significance for the wristlock. These results show that the anxiety manipulation was successful.

Performance measures

Participants' performance was rated significantly lower in the HA than in the LA condition for the push kick and for the knife block (Table 3.2). In addition, the opponent was kicked back significantly less distance during the HA condition than during the LA condition. Performance was not rated significantly different between the conditions for the wristlock.

Table 3.2. Means, standard deviations, and *t*-test statistics for perceived anxiety, perceived mental effort, heart rate, performance score and opponent distance in low- and high-anxiety conditions.

	Low-anxiety	High-anxiety	Statistics
Anxiety scores			
Push kick	2.72 (1.77)	4.34 (1.92)	$t(12) = 4.32$, $p < .01$, $d = 0.88$
Knife block	2.32 (1.52)	4.62 (2.01)	$t(12) = 6.87$, $p < .001$, $d = 1.29$
Wristlock	2.72 (1.51)	3.89 (1.91)	$t(12) = 4.34$, $p < .01$, $d = 0.68$
Mental effort score			
Push kick	39.08 (15.31)	55.69 (18.55)	$t(12) = 4.77$, $p < .001$, $d = 0.98$
Knife block	33.54 (15.81)	55.00 (17.60)	$t(12) = 7.42$, $p < .001$, $d = 1.29$
Wristlock	35.77 (15.59)	50.62 (14.89)	$t(12) = 5.19$, $p < .001$, $d = 0.97$
Heart rate (bpm)			
Push kick	117.39 (13.80)	128.34 (12.47)	$t(12) = 4.37$, $p < .01$, $d = 0.83$
Knife block	113.63 (14.53)	122.86 (13.40)	$t(12) = 2.21$, $p = .054$, $d = 0.66$
Wristlock	121.03 (15.16)	127.82 (13.64)	$t(12) = 4.84$, $p < .01$, $d = 0.47$
Performance score (1-5)			
Push kick	4.32 (.42)	3.82 (.41)	$t(12) = 3.34$, $p < .01$, $d = 1.20$
Knife block	4.45 (.62)	3.63 (.70)	$t(12) = 4.34$, $p < .01$, $d = 1.24$
Wristlock	3.75 (.49)	3.57 (.49)	$t(12) = 1.12$, $p = .29$, $d = 0.37$
Opponent distance (cm)			
Push kick	55.33 (22.86)	25.52 (21.37)	$t(12) = 4.00$, $p < .01$, $d = 1.35$

Movement variables push kick

Movement times. The MANOVA on movement times revealed a significant main effect for condition, $F(3,10) = 14.02$, $p < .01$, $\eta_p^2 = .82$. Follow-up univariate ANOVAs showed that reaction time was shorter in the HA condition than in the LA condition, $F(1,12) = 17.94$, $p < .01$, $\eta_p^2 = .62$, 95% CI [83, 262]. There were no significant differences in duration between the conditions for the aim-and-accelerate phase, $F(1,12) = 0.20$, $p = .67$, and push phase, $F(1,12) = 0.54$, $p = .48$. These results show that participants reacted sooner to the knife attack in the HA condition, but that execution time did not differ between conditions (Table 3.1).

Posture variables. The MANOVA on posture variables revealed a significant main effect for condition, $F(2,11) = 4.03$, $p < .05$, $\eta_p^2 = .42$. Follow-up univariate ANOVAs showed that the participants' backwards lean at kick onset was larger in the HA condition than in the LA condition, $F(1,12) = 5.56$, $p < .05$, $\eta_p^2 = .32$, 95% CI [0.4, 10.0], while it just failed to reach significance at first contact, $F(1,12) = 3.63$, $p = .08$, $\eta_p^2 = .23$, 95% CI [-0.03, 4.3].

Velocity and acceleration variables. The MANOVA on peak velocity of the lower leg revealed a significant main effect for condition, $F(2,11) = 8.05$, $p < .01$, $\eta_p^2 = .617$. Follow-up univariate ANOVAs showed that the peak velocity before contact was higher in the HA than in the LA condition, $F(1,12) = 10.53$, $p < .01$, $\eta_p^2 = .490$, 95% CI [0.115, 0.599]. The difference was not significant during contact, $F(1,12) = 2.07$, $p = .18$. The MANOVA on peak acceleration revealed no significant main effect for condition, $F(2,11) = .45$, $p = .65$.

Movement variables knife block

Movement times. The MANOVA on movement times revealed a significant main effect for condition, $F(2,11) = 6.00$, $p < .05$, $\eta_p^2 = .57$. Follow-up univariate ANOVAs showed that the reaction time was shorter in the HA condition, $F(1,12) = 8.26$, $p < .05$, $\eta_p^2 = .45$, 95% CI [18, 145]). There was no significant effect for condition on duration of the block phase, $F(1,12) = .01$, $p = .93$. Similar to the push kick, these results show that participants reacted sooner to the knife attack in the HA condition, while execution time did not differ (Table 3.1).

Posture variables. The MANOVA on posture variables revealed a significant main effect for condition, $F(2,11) = 7.54$, $p < .01$, $\eta_p^2 = .58$. Follow-up univariate ANOVAs showed a significant difference between conditions in standing height, $F(1,12) = 9.09$, $p < .05$, $\eta_p^2 = .43$, 95% CI [1.5, 9.2] and blocking height, $F(1,12) = 6.74$, $p < .05$, $\eta_p^2 = .36$, 95% CI [1.9, 21.5], implying that participants decreased their height and blocked lower in the HA condition.

Velocity and acceleration. The MANOVAs on peak velocity and acceleration revealed no significant main effect for condition, $F(2,11) = 1.69$, $p = .23$ and $F(2,11) = 1.21$, $p = .34$.

Movement variables wristlock

Movement times. The MANOVA on movement times revealed no significant main effect for condition during different phases of the task, $F(2,11) = 1.37$, $p = .29$, although the average control phase appeared to be longer under HA (see also the large standard deviation). An additional two-tailed paired *t*-test on the ratio of the grabbing and control phase yielded a significant difference between conditions, $t(12) = 2.19$, $p < .05$, $d = .75$, 95% CI [0.003, 1.37], indicating that there was a change in execution in the HA condition (Table 3.1).

Discussion

In the current study, we investigated whether police officers' performance of arrest and self- defence skills (ASDS) was negatively affected by anxiety. Furthermore, we aimed to investigate whether and how the kinematics of ASDS differ when police officers perform these skills under low and high anxiety. We were particularly interested in examining whether kinematics would show indications of avoidance behaviour as demonstrated in previous handgun shooting experiments. We compared performance and movement behaviour between a low-anxiety (LA) and a high-anxiety (HA) condition, in which participants were attacked with either a rubber or a shock knife respectively. The manipulation between the two conditions was successful: participants perceived more anxiety, invested more mental effort and had higher heart rates in the HA condition. Even though officers invested extra mental effort in the HA condition, performance scores of push kicks and knife blocks were significantly lower than in the LA condition. In addition, police officers kicked the opponent only half as far away as in the LA condition. Regarding the wristlock, the higher ratio between time intervals and the higher standard deviations in movement times point to a lower consistency in execution in the HA condition. Clearly, performance decreases in push kicks and knife blocks confirm earlier findings of Nieuwenhuys et al. (2009) that performance of ASDS is affected by anxiety. The results of our kinematic data provide more detailed insight into why and how performance of the police officers decreased under HA.

Under HA, we expected that motivational avoidance tendencies would result in faster responses to decrease the time being exposed to the threat. Results confirmed this hypothesis for the push kick and the knife block: the officers initiated their responses to the knife attack earlier. In addition, in the push kick, peak velocity of the foot was higher before it made contact with the opponent, but not during contact. These faster responses are in line with earlier findings in studies with police officers (e.g., Nieuwenhuys & Oudejans, 2010), but contrast with a recent investigation of approach and avoidance movements, which reported that participants respond faster when they are instructed to move away from the threat compared to when they are instructed to move towards the threat (Stins et al., 2011). Officers in the present study did not have the option to move away. However, by speeding up their responses, they were able to reduce the time they were exposed to the threat. Police officers in the study of Nieuwenhuys and Oudejans (2010) reported that they tried to be quicker to reduce the chance of getting hit. Jordet and Hartman (2008) found similar behaviour during penalty shootouts in football (soccer). Players who were less successful took less time to prepare their shot. It is thus plausible that faster responses with increased levels of anxiety are indications of avoidance behaviour in an attempt to 'get it over with as soon as possible'.

Under HA, police officers' posture also showed characteristics of avoidance behaviour. In the push kick, police officers showed an increase in backwards lean before their foot made contact with the opponent, which led to a decrease in kick power (Béraud &

Gahéry, 1995). In the knife block, officers ducked down and blocked lower under HA, despite the most effective strategy being to stand tall and block close to the opponent's hand. This latter strategy would prevent the opponent from getting the chance to push through the block or to slide over the blocking arm. However, it appeared that the officers were not able to sufficiently override their stimulus-driven reaction; hence, they showed characteristics of avoidance behaviour.

Avoidance behaviour in acute-threat situations is the likely result of being less able to enforce goal-directed processing and inhibit stimulus-driven processing (Eysenck et al., 2007; Nieuwenhuys & Oudejans, 2012). Several experiments have reported that the common amygdala-prefrontal circuitry is altered when people are anxious, which creates a bias towards threat-related responses (e.g., Bishop, Duncan, Brett & Lawrence, 2004; Bishop, Duncan, & Lawrence, 2004). In general, this means that it is harder to focus on task-relevant information when anxiety is increased (Nieuwenhuys, Savelsbergh, & Oudejans, 2012). In the present study, police officers were less able to move the trunk forward in the push kick or to stand tall and block high in the knife block. Overall, it appears that the preferred goal-directed behaviour was incongruent with the emotional state police officers experienced: they were not sufficiently able to inhibit avoidance tendencies in their behaviour, which led to less effective performance. Nieuwenhuys and Oudejans (2011) showed that training under threatening circumstances (police officers could be hit by coloured soap cartridges) could be an efficient method for officers to learn to inhibit avoidance behaviour and maintain goal-directed behaviour during handgun shooting. Future research is needed to determine whether such training would lead to similar positive effects for ASDS.

Note that several limitations need to be kept in mind. First, due to tight schedules of the police and limited availability of the equipment, we were only able to test thirteen officers, which limits the extent to which our findings can be generalized. Still, we believe that the present study makes a valuable contribution by showing indications of avoidance behaviour when performing perceptual-motor tasks with anxiety (cf. Jordet & Hartman, 2008; Nieuwenhuys & Oudejans, 2010). Second, the experimental study is not fully representative of performance during violent situations in the line of duty with its clear focus on execution only. In the line of duty, officers have to make decisions about the appropriate line of action also on the basis of the availability of their regular equipment such as a handgun and pepper spray. How anxiety would affect such decision making is unclear (see also Nieuwenhuys et al., 2012). Thus, generalizing our findings for this particular situation to other situations in the line of duty needs to be done with caution.

To summarize, the results indicate that in threatening circumstances, police officers' performance of ASDS decreases. Results from kinematic data suggest that police officers showed characteristics of avoidance behaviour when they were more anxious: they reacted sooner to the knife attack, leaned further backwards when executing push kicks,

and ducked down and blocked lower in the knife blocks. In line with recent theoretical developments, the results suggest that police officers appear less able to inhibit stimulus-driven processing (fear of getting hit) and enforce goal-directed processing (perform the skill as well as possible) leading to avoidance behaviour and a decrease in performance.

CHAPTER 4

Effects of threat, trait anxiety and state anxiety on police officers' actions during an arrest

Renden, P.G., Landman, A., Daalder, N.R., De Cock, H.P., Savelsbergh, G.J.P., & Oudejans, R.R.D. (in press). Effects of threat, trait anxiety and state anxiety on police officers´ actions during an arrest. *Legal and Criminological Psychology*. DOI:10.1111/lcrp.12077.

Abstract

Purpose: We investigated the effects of threat and trait anxiety on state anxiety and how that affects police officers' actions during an arrest. Most experiments on police performance under anxiety test the performance of one particular skill. Yet, police work often involves concerted use of a combination of skills.
Methods: We created situations – with two different levels of threat – in which officers had to choose and initiate their actions in order to control and arrest a non-cooperative suspect. We examined whether threat, trait anxiety and state anxiety influenced decision making (e.g., choosing the appropriate actions) and performance (e.g., quality of communication and the execution of skills).
Results: Trait anxiety affected the level of state anxiety, but not any of the decision-making and performance variables. As for decision making, results showed that only threat determined which action officers took to gain control over the suspect. As for performance, higher levels of state anxiety were accompanied by lower scores of overall performance, communication, proportionality of applied force, and quality of skill execution.
Conclusion: It is concluded that state anxiety not only impairs performance of single perceptual motor-tasks, but also relevant accompanying skills such as communicating and applying appropriate force. We argue that police training should focus on an integrated set of decision-making and perceptual-motor skills and not just on the performance of isolated motor skills.

Keywords: Challenge state; Perceptual-motor performance; Police work; State anxiety; Trait anxiety; Threat state

Introduction

In the line of duty, police officers occasionally experience different kinds of pressure (e.g., Anderson, Litzenberger, & Plecas, 2002). Think, for example, of an officer fighting off an aggressive suspect or using a firearm. In such high-pressure situations, officers' performance may decrease as a result of pressure-induced state anxiety. State anxiety can be defined as "an aversive emotional and motivational state in threatening circumstances" (Eysenck, Derakshan, Santos, & Calvo, 2007, p. 336), and is "related to the subjective evaluation of a situation, and concerns jeopardy to one's self-esteem during performance or social situations, physical danger, or insecurity and uncertainty" (Schwenkmezger & Steffgen, 1989, p. 78-79). Several studies have shown that officers perform worse in high-anxiety situations than they do in low-anxiety situations, both in a handgun shooting task (e.g., Nieuwenhuys & Oudejans, 2010, 2011: Oudejans, 2008) and when executing arrest and self-defence skills (e.g., Nieuwenhuys, Caljouw, Leijsen, Schmeits, & Oudejans, 2009; Renden, et al., 2014).

The recent model by Nieuwenhuys and Oudejans (2012) provides an explanation for the influence of state anxiety on perceptual-motor performance. The model, based on attentional control theory for cognitive tasks (Eysenck et al., 2007), states that when individuals have to perform in high-anxiety situations, their attention is often drawn away from task-relevant stimuli towards threat-related (and task-irrelevant) sources of information. As a result, there is less goal-directed attention available for decision making and/or task execution.

As an example, Nieuwenhuys, Savelsbergh, and Oudejans (2012) investigated whether officers' decision making differed between low- and high-anxiety conditions. Standing in front of a video screen, officers had to decide whether to shoot at a suspect who suddenly appeared either with a gun and shot at the participant, or who appeared without a gun and surrendered. High anxiety was created using a shoot-back canon that occasionally projected small (painful) plastic bullets. In the high-anxiety condition, officers responded faster and were more likely to shoot at the suspect who surrendered. When this happened, officers' shooting responses were so fast that they most possibly could not have seen whether the suspect appeared with or without a gun. Seemingly the officers did not take sufficient time to obtain the right information, leading them to make incorrect decisions.

In addition to changes in decision making, anxiety-related shifts in attention have also been found in officers when performing a perceptual-motor task (Nieuwenhuys & Oudejans, 2010, 2011). In a shooting exercise, the gaze behaviour of officers placed under high-anxiety showed that they focussed more on threat-related informational sources like an opponent's handgun than they did in a low-anxiety condition. Consequently, the duration of the visual fixations on the target reduced. Furthermore, officers acted faster and were more likely to duck to reduce their chance of getting hit. These findings show that, under the influence of state anxiety, attention (and thereby behaviour) can

shift from goal-directed behaviour (i.e., fixating on targets) to stimulus-driven behaviour (i.e., to avoid getting hit), ultimately leading to decreased task performance (less hits) (see Renden et al., 2014 for similar results with arrest and self-defence skills).

Although the negative influence of state anxiety on police officers' decision making and task execution is well established, it is less clear whether the experimental findings are fully representative for situations on duty. Most studies have investigated specific and pre-determined police tasks in an isolated manner (e.g., shooting, kicking, blocking), while much of what police officers do in the line of duty, for instance, arresting a suspect, involves the concerted use of a combination of skills such as communicating, positioning, choosing the most appropriate action at the most appropriate time, and adequate handcuffing. Therefore, it remains to be determined whether and to what degree state anxiety has a negative influence on decision making and performance in less-constrained settings.

In addition, it is necessary to explore which factors influence the level of state anxiety and to what degree. Experimental studies have shown that the degree of threat, together with the necessary police task at hand, determine a certain level of state anxiety (e.g., Nieuwenhuys & Oudejans, 2010; Renden et al., 2014). However, officers' trait anxiety (officers' tendency to respond with anxiety to certain situations) is presumably also an important factor for the degree to which officers experience state anxiety on duty.

The aim of the present study was to investigate the effects of threat and trait anxiety on state anxiety and how that affects police officers' actions during an arrest. We aimed to create different levels of threat (on the basis of more or less threatening behaviour of a suspect) in an experimental situation in which officers had to observe and interpret the situation encountered in order to select and perform the most appropriate actions. Therefore, officers received only the instruction to arrest a suspect. To do so, they could use their regular police (training) tools (pepper spray, handcuffs, handgun, and short baton). Letting officers initiate their actions themselves allowed an examination of *when* officers initiated *what* actions. We also assessed the behaviour of officers using several performance variables including additional measures of communication and proportionality, both variables that are very important during police work but so far remain un-investigated.

We expected that both higher threat and higher trait anxiety would individually lead to higher levels of state anxiety. Furthermore, we expected an interaction between threat and trait anxiety. This would mean that officers with higher trait anxiety would be more sensitive to threat in such a way that threatening behaviour of the suspect would have a stronger effect on their state anxiety. Next, more state anxiety was expected to affect decision making in terms of earlier initiation of actions and more frequent use of pepper spray rather than physical techniques to control the suspect (cf. Nieuwenhuys et al., 2012). We also expected that more state anxiety would lead to decreased performance as would be evidenced by lower scores on communication, distance to the suspect, proportionality

of applied force, quality of skill execution, handcuffing, and overall performance (cf. Renden et al., 2014).

Method

Participants

A total of 88 police officers (67 men, 21 women) with a mean age of 26.4 years (*SD* = 6.0) participated in the study. On average, officers had 3.5 years (*SD* = 2.3) of working experience. Participants provided written informed consent prior to participation and the experiment was approved by the ethics committee of the research institute.

Scenario and tasks

Participants were asked to enter a 12 x 12 m practice room to arrest a person who was under suspicion of committing physical abuse. The suspect's initial location was in the corner of the room opposite to where the participant entered. The role of the suspect was played by one of three police instructors (all were men, Caucasian, not extravagantly muscular, and around 1.80 m tall). By working with comparable suspects, we believe that the suspects' physical appearance was not very likely to have had an influence on the pattern of results. When the participant entered the room, the suspect walked a few meters towards the participant. He asked what the participant was doing there, and indicated that he did not want to cooperate and that he wanted the participant to leave. The arrest that followed could be roughly divided into three phases: communication, gaining control and handcuffing.

In the communication phase, participants were assessed on their ability to show an assertive posture and verbal control over the situation. In the control phase, according to protocol, participants could either use physical-control techniques or pepper spray to gain control of the suspect. Physical control was deemed to be more suitable in situations where the level of threat posed by the suspect was relatively low. Physical control techniques that are applicable in this situation are techniques with which the officer controls the suspect's arm or shoulder (or both) and forces him against a wall or onto the floor. Pepper spray was deemed to be more suitable when the level of threat posed by the suspect was relatively high. Pepper spray is used by spraying the contents of the can towards the suspect's eyes from a maximum distance of 4 meters. In the handcuffing phase, if the participant had used physical control techniques and placed the suspect against the wall, it was necessary for officers to use sufficient force (e.g., by using their hip or upper leg) to remain in control before they physically abducted the suspect's right arm and started handcuffing. If pepper spray had been used, the participant could order the suspect to sit on his knees and optionally push him towards the floor. Then, the participant would abduct the suspect's right arm and started handcuffing.

During the different phases of the arrest, participants were assessed on their ability to keep the correct distance from the suspect (depending on the phase and applied

skills), to use proportional force, and to show certainty in their movements. Overall, the suspect could resist slightly in the form of pulling away his hands and turning away, but he would comply if the participant was decisive in applying legal force. As a result, a successful arrest could only be made if the participant had full control over the suspect.

Threat

Half of the participants performed the arrest in a low-threat (LT) scenario and the other half in a high-threat (HT) scenario. Participants were randomly assigned to one of the two threat-scenarios. We chose a between-subjects design, rather than a repeated measures design, to prevent participants from learning from their performance in the first scenario and leading to potential differences in the manner in which the scenario was performed the second time (irrespective of threat or anxiety). In the LT scenarios (35 men, 9 women; *M* age = 26.9, *SD* = 6.5; *M* working experience = 3.6, *SD* = 2.4), the suspect retained a calm voice and attitude, but he also expressed annoyance and unwillingness to co-operate with his arrest. He would try to initiate a dialogue with the participant and try to drag the attempted arrest into a lengthy discussion. In the HT scenarios (32 men, 12 women; *M* age = 25.8, *SD* = 5.5; *M* working experience = 3.5, *SD* = 2.1), the suspect intimidated the participant verbally and used aggressive gestures. He threatened with violence but he offered no more physical resistance than he did against participants in the LT scenarios.

Materials and measures

Anxiety. To determine participants' trait anxiety scores, we used the Dutch version of the STAI A-Trait Scale (Van der Ploeg, Defares, & Spielberger, 1980). The scale contains 20 questions about how participants generally feel. Participants answered the questions using a 4-point Likert scale.

To determine participants' state anxiety during the arrest, we used a visual-analogue anxiety scale (i.e., 'the anxiety thermometer', Houtman & Bakker, 1989) that had been successfully used in earlier experiments (e.g., Nieuwenhuys et al., 2009; Nieuwenhuys & Oudejans, 2010, 2011; Oudejans & Pijpers, 2009, 2010; Renden et al., 2014). The anxiety thermometer is a 10-cm continuous scale on which participants rated the state anxiety they had experienced during the arrest, ranging from 0 (not anxious at all) to 10 (extremely anxious). The validity and test-retest reliability are fair, with correlation coefficients ranging between .60 and .78 (Houtman & Bakker, 1989).

Measures of behaviour. During the experiment, two digital video cameras (Creative VADO® HD, 30 Hz, 1200 x 780 pixels) that were placed in two diagonally opposite corners of the room recorded the arrests. Two experimenters operated the cameras so that the participant and suspect were visible during the entire arrest. Recordings were used for the post-hoc analysis of decision making and performance.

Đ ision making. Decision making was operationalized using two different types of measures.

Skill applied to gain control of the suspect. Participants wore a regular police belt with regular police training tools: a dummy handgun, practice pepper spray, handcuffs and a short baton. From the video recordings, an experimenter determined whether participants either used physical-control skills or pepper spray to gain control over the suspect.

Phase durations. Decision making in these scenarios involved not only *what* actions officers performed but also *when* they performed those actions. The durations of the three phases of the arrest were determined (in seconds; also from video recordings) to provide insights into the timing of the officers' actions: the *communication phase* lasted from the moment the officer first step into the room to the moment the officer first used force to gain control over the suspect (applying the first physical action such as an arm or shoulder grasp, or taking the pepper spray from the belt); the *control phase* lasted from the moment the officer first used force to the moment they first took the handcuffs from their belt; and the *handcuffing phase* lasted from the moment the handcuffs were first taken from the belt to the moment the second handcuff was locked to the wrist of the suspect.

A second experimenter performed a reliability check for each of the dependent variables by repeating the same procedure for the video footage of 30 arrests. Percentages of error were determined by dividing the difference in durations (in milliseconds) between the two raters (of all 30 clips) by the average duration of the two raters multiplied by a hundred (Hughes, Cooper, & Nevill, 2004). The percentages of error were all smaller than 1% (communication phase, 0.17%; control phase, 0.29%; handcuffing phase, 0.77%), implying that the phases were determined with high reliability (Hughes et al., 2004). As two participants took their handcuffs before they initiated their actions for gaining control, their phase durations were not comparable with those of the other participants. Therefore, the phase durations of these two participants were removed from the analyses.

Performance. We used a 5-point Likert scale to assess a number of measures of task performance on each trial, employing a technique that has been used successfully in earlier arrest and self-defence experiments by Nieuwenhuys et al. (2009) and Renden et al. (2014). A higher score on the scale indicates a better performance. Nieuwenhuys et al. reported satisfactory inter-rater reliability (.67) and intra-rater reliability (.77) and good external and concurrent validity. A police instructor assessed the performance of participants on each trial using six variables: *overall performance*, *communication* (showing assertive posture, getting and maintaining control of the situation), *distance to the suspect* (keeping the correct position in relation to the suspect), *proportionality of applied force* (applied force in proportion to the threat of the suspect), *quality of skill execution* (execution of techniques), and *handcuffing* (correctly putting on the handcuffs while maintaining control over the suspect). Originally, we employed separate scores for ver-

bal and non-verbal communication, but due to a high correlation between the two, we combined them into a single variable.

As a reliability check, two additional police instructors also assessed the performance of participants while viewing the video footage of 30 arrests. All three police instructors were experienced (more than five years) in assessing such scenarios in the police training centre using these variables. Furthermore, the instructors all had experience as a police officer before they became an instructor and all still operate as an officer from time to time. The scenarios were assessed in a random order. Inter-rater reliability was assessed using Kendall's *W*. Results showed satisfactory inter-rater reliabilities (Van Rossum & Gagné, 1994): overall performance, $W(29) = .63$, $p < .01$; verbal communication, $W(29) = .60$, $p < .01$; non-verbal communication: $W(29) = .65$, $p < .01$; distance, $W(29) = .65$, $p < .01$; proportionality of applied force, $W(29) = .52$, $p < .05$; quality of skill execution, $W(29) = .63$, $p < .01$; handcuffing, $W(29) = .58$, $p < .01$.

Procedure

Before starting the experiment, participants were briefed about the general purpose of the experiment, provided written informed consent, and completed the STAI. Next, they put on their police belt and received the practice pepper spray, handcuffs and the dummy handgun. Participants then received their assignment and stepped into the room to perform the arrest. Immediately after the arrest, participants rated their state anxiety as experienced during the arrest.

Data analysis

To assess the individual effects of threat (dichotomous variable) and trait anxiety (continuous variable) on state anxiety, we performed two different tests. For the effect of threat (LT and HT), we performed an independent sample *t*-test. To assess the effect of trait anxiety, we calculated Pearson's correlation coefficients (decision-making and performance variables were also included to get a first impression of the relations). Correlation coefficients $r < .30$, $r \geq .30$ and $r \geq .50$ were considered to have small, medium and large strength, respectively (Cohen, 1988).

To assess a possible interaction between threat and trait anxiety on their influence on state anxiety, we performed a multiple regression analysis. To assess the influence of threat, trait anxiety, and state anxiety on the decision-making variables, we performed a binary logistic regression analysis for the skill that was applied to gain control of the suspect (0 = Physical control technique; 1 = Pepper spray), and a multiple regression analysis for phase durations. To assess the influence of threat, trait anxiety, and state anxiety on performance, we also performed a multiple regression analysis. For all linear regression analyses, effect sizes were calculated using Cohen's f^2 with 0.02 or less, about 0.15 and 0.35 or more, representing small, moderate, and large effects, respectively (Cohen, 1988).

The regression analyses were performed using a forward stepwise method (for more information, see Twisk, 2003, 2007, and Pluijms, Cañal-Bruland, Hoozemans, & Savelsbergh, 2015). All possible predictors were first examined regarding their relationship with the outcome variable using single regression analyses. Then, the predictor that best predicted the outcome variable, based on the lowest *p*-value (provided that $\alpha < .10$) was included in an initial model with only the constant and the predictor. The next step was to include a second predictor, which was retained in the model if it significantly increased the proportion of the variance in the outcome variable explained by the model. This procedure continued until all variables were examined and included or rejected. After all predictor variables were tested, the predictor variables that were included in the model were tested on whether they interacted with other variables in predicting the outcome variable. Again, if an interaction between two variables significantly increased the proportion of the variance explained, it was retained in the model and excluded if it did not.

Results

General findings

There was no significant difference in the state anxiety of participants between the LT ($M = 3.81$, $SD = 1.87$) and HT scenarios ($M = 4.40$, $SD = 2.21$), $t(86) = 1.35$, $p = .18$, implying that in general, more threat did not make the officers more anxious. State anxiety levels were already reasonably high in the LT scenarios (cf. Oudejans & Pijpers, 2009, 2010; Renden et al., 2014) such that the HT scenarios apparently did not lead to even higher levels of state anxiety. Still, trait anxiety was positively correlated with state anxiety ($r = .394$; see Table 4.1) implying that, to a certain degree, officers' trait anxiety was associated with the level of state anxiety during the arrest. Trait anxiety did not correlate with any of the decision making or performance variables. However, state anxiety did negatively correlate with overall performance, communication, proportionality of applied force, and quality of skill execution.

As for overall performance, officers scored on average between 3 and 4, implying that they performed sufficiently, but did not excel during the arrest. Overall performance correlated negatively with the durations of the control phase and the handcuffing phase ($r = -.721$ and $-.242$ respectively; see Table 4.1), implying that a longer duration from the initiation of the first action until handcuffing was complete, was generally associated with worse performance. Handcuffing correlated negatively with the duration of the control phase ($r = -.49$). The need for more time during the control phase may indicate less resolution in gaining control (and probably not having control) leading to less quality in handcuffing. In addition, all performance variables correlated with each other showing that better performance on one variable was generally associated with better performance on the others.

Table 4.1. Mean scores of trait anxiety, state anxiety, phase durations, and performance scores (SDs between parentheses) and correlations between the variables. Variables 1-10 across the top equal 1-10 reported in the first column.

	Mean (*SD*)	Correlations									
		1	2	3	4	5	6	7	8	9	10
Anxiety											
1. Trait anxiety (20-80)	31.05 (4.74)										
2. State anxiety (1-10)	4.11 (2.05)	.394***									
Decision making											
(phase durations, in seconds)											
3. Communication phase	18.33 (12.82)	.002	.128								
4. Control phase	25.47 (18.53)	.104	.095	-.189							
5. Handcuffing phase	14.37 (6.28)	.045	.132	-.012	.113						
Performance (1-5)											
6. Overall performance	3.66 (1.05)	-.150	-.329**	-.143	-.732***	-.242*					
7. Communication	3.87 (0.91)	-.166	-.350**	-.122	-.173	-.185	.809***				
8. Distance to the suspect	3.83 (1.00)	-.057	-.128	-.008	-.160	-.112	.636***	.654***			
9. Proportionality of applied force	4.27 (0.71)	-.094	-.307**	-.041	-.188	-.120	.623***	.656***	.556***		
10. Quality of skill execution	3.65 (1.04)	-.159	-.342**	-.067	-.166	-.208	.805***	.797***	.629***	.695***	
11. Handcuffing	3.61 (1.07)	.057	-.060	-.003	-.490***	-.205	.662***	.452***	.543***	.340**	.467***

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

Regression analyses

Anxiety. The multiple regression analysis showed that trait anxiety was the single significant predictor for state anxiety, explaining 16% of the variance of the state anxiety scores, $F(1,85) = 15.58$, $p < .001$, $f^2 = .19$ (see Table 4.2). Although we expected that an interaction between threat and trait anxiety would predict a significant proportion of state anxiety, this was not the case, $p = .96$. Taken together with the lack of difference in the state anxiety scores between the LT and HT scenarios, it appears that the difference in threat between the two scenarios was simply not strong enough to create any differences in state anxiety.

Decision making. As mentioned, decision making was operationalized using two different types of measures, the skill applied to gain control of the subject and phase durations.

Skill applied to gain control of the suspect. The binary logistic regression analysis showed that threat was the single predictor of the skill that officers used to gain control of the suspect: in the HT scenarios there was an eight times higher chance that officers used pepper spray (35 times) instead of physical control techniques (9 times), $B = 2.12$, $\text{Exp}(B) = 8.33$ (see Table 4.2). In contrast, most officers used physical control techniques in the LT scenarios (30 times) instead of pepper spray (14 times).

Table 4.2. Outcomes of regression analyses with forward selection procedure.

	B	*SE*	*p*-value
Anxiety			
State anxiety			
Trait anxiety	.17	.04	$p < .001$
Decision making			
Frequency skills			
Threat	2.12 Exp(*B*) = 8.33+	.49	$p < .001$
Communication phase			
Threat	-10.66	2.48	$p < .001$
State anxiety	1.41	0.61	$p < .05$
Threat × State anxiety	-3.01	1.22	$p < .05$
Control phase			
Threat	15.23	3.66	$p < .001$
Performance			
Overall performance			
State anxiety	-0.17	0.05	$p < .01$
Communication			
State anxiety	-0.16	0.05	$p < .01$
Proportionality of applied force			
State anxiety	-0.11	0.04	$p < .01$
Quality of skill execution			
State anxiety	-0.17	0.05	$p < .01$

+In the high-threat scenarios, there was a 8.33 higher chance that officers would use pepper spray instead of physical control skills.

Phase durations. A multiple regression analysis showed that threat, state anxiety, and the threat × state anxiety interaction were significant predictors of the duration of the communication phase, explaining 24% of the variance, $F(3,82) = 8.61$, $p < .001$, $f^2 = .32$ (see Table 4.2). The significant interaction reflects the finding that in the LT scenarios more state anxiety resulted in later initiations of actions, $R^2 = .15$, whereas in the HT scenarios state anxiety was not a significant predictor of the duration, $R^2 < .001$. For the control phase, threat was the single significant predictor of the duration of the control phase, explaining 17% of the variance, $F(1,84) = 17.30$, $p < .001$, $f^2 = .20$. In the HT scenarios, officers took more time for the control phase (i.e., from the initiation of their first action until they started handcuffing) than they did in the LT scenarios. There were no significant predictors for the duration of the handcuffing phase.

Performance. The multiple regression analysis found that state anxiety was a significant predictor explaining 14% of the variance in the score of overall performance, $F(2,84) = 6.89$, $p < .01$, $f^2 = .16$ (see Table 4.2). Increased state anxiety was related with worse performance, which was also true for the separate performance variables *communication*, $F(1,86) = 12.02$, $p < .01$, $f^2 = .14$, *proportionality of applied force*, $F(1,86) = 8.93$, $p < .01$, $f^2 = .10$, and *quality of skill execution*, $F(1,86) = 11.38$, $p < .01$, $f^2 = .14$, explaining 12%, 9%, and 12% of the variance of the scores, respectively. There were no significant predictors for distance to the suspect and for handcuffing.

Discussion

We investigated the effects of threat and trait anxiety on state anxiety and how that affects police officers' actions during an arrest. Officers performed an arrest when a suspect behaved in a way that was designed to be either less or more threatening. Yet, the different levels of threat did not lead to different levels of state anxiety. Trait anxiety, on the other hand, was positively related with state anxiety, implying that officers with higher trait anxiety experienced more state anxiety during the arrest irrespective of the level of threat.

We used different types of variables to assess the decision-making performance of participants, namely the skill applied to gain control of the suspect and the duration of the key phases in the participant's response. For the skill applied to gain control of the suspect, most officers seemed to base their decision on the level of threat the suspect exerted, leaving threat as the only variable that predicted which skill the officers employed. That the level of state anxiety did not influence which skill the officers used was in contrast to our expectations, which were based on the findings by Nieuwenhuys et al. (2012). In that study a relatively 'simple' decision was required of participants, namely whether to shoot the suspect or not based on whether he appeared with a handgun or surrendered (thus the possible actions were already pre-determined). Apparently, situational characteristics seem to influence if and how anxiety affects officers' actions and decisions (cf., Dicks, Davids, & Button, 2009; Dicks, Button,

& Davids, 2010). Still, we did find that state anxiety had an effect on the duration of the key phases in the participants' responses. The length of time needed to approach the suspect in the low-threat scenarios differed according to state anxiety: officers who experienced more state anxiety initiated their actions to gain control later than officers who experienced less state anxiety. This indicates that the task (approach and arrest the suspect) was incongruent with the emotion that more anxious officers experienced and they may therefore have hesitated longer before approaching the suspect and using physical control techniques (cf. Stins et al., 2011).

As for performance, it appeared that trait anxiety was not related to any of the assessed performance variables. State anxiety on the other hand negatively affected overall performance along with the more specific measures of communication, proportionality of applied force, and quality of skill execution, regardless of how the suspect behaved (less or more threatening). Worse communication implies reduced control over the conversation and a less assertive posture. Worse proportionality implies insufficient warnings and applying less appropriate force. Poorer skill execution implies less decisive and effective actions in gaining control of the suspect.

Our results add to the existing literature by showing that state anxiety not only impairs the performance of a single perceptual motor-task such as performing a block or a handgun shot, but it can also concurrently impair other relevant skills such as the ability to effectively communicate and to apply appropriate force. On the basis of previous research, we can speculate that with higher anxiety, attention was presumably shifted towards threat-related sources of information (cf. Nieuwenhuys & Oudejans, 2012). As a consequence, officers seemed to hesitate when initiating their actions and performed worse on communication, proportionality, and skill execution during the arrest. Overall, the negative influence of state anxiety may have serious consequences on the ability of police officers to perform their daily duty. In light of these results, we argue that police training should focus on an integrated set of decision-making and perceptual-motor skills and not just on the motor performance of isolated skills. In doing so, it is important that officers encounter sufficient variation in situations under threatening circumstances to experience how high pressure may affect their actions and to learn in what ways they can maintain performance (cf. Nieuwenhuys & Oudejans, 2011).

An important question that remains is why one officer may have a greater tendency to respond with state anxiety than another. Here, the different levels of threat did not lead to different levels of state anxiety. Trait anxiety did influence state anxiety, but it had no effect on the outcome variables. Therefore, it seems that trait anxiety cannot fully account for the variability among officers' state anxiety and their actions. Another explanation for the variability in state anxiety among officers is provided by the biophysical model of challenge and threat (Blascovich, 2008). In short, the model describes that individuals evaluate whether they have the necessary resources to successfully perform a task. If they

believe they do, a challenge state occurs, if not, a threat state occurs. It is possible that the officers in our experiment who experienced more anxiety experienced a threat state. Previous studies have shown that a threat state is associated with higher levels of state anxiety (e.g., Quested et al., 2011; Williams, Cumming, Balanos, 2010), less effective attention (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004; Moore, Vine, Wilson, & Freeman, 2012), and worse performance (e.g., Gildea, Schneider, & Shebilske, 2007). Future research is needed to investigate whether challenge and threat states explain variability in state anxiety among officers and how their states relate to performance.

Note that a number of limitations should be taken into account. First, we cannot rule out that officers' performance influenced their assessment of their state anxiety as we only assessed these scores after the arrest. However, Houtman and Bakker (1989) and Bakker, Vanden Auweele, and Van Mele (2003) have both shown that there are relatively high correlations (most above .70) between anxiety scores taken before and after a task. Moreover, Houtman and Bakker showed that the experienced task difficulty and expected mark (participants performed an exam) did not significantly correlate with anxiety scores (obtained from the anxiety thermometer, the A-Trait Scale and A-state scale of the STAI). Therefore, we assume that worse performance was a result of more anxiety and not the other way around. Second, general information given to participants before they entered the room may have primed them to expect a certain amount of threat. Although previous research has suggested that briefings before experiments do not significantly affect officers' behaviour (e.g. Mitchell & Flin, 2007), expectations may have played a role in the reasonably high levels of state anxiety in the low-threat scenarios.

To conclude, we found no effect of state anxiety on officers' choice of actions to gain control over a suspect during a police arrest. These actions were mainly determined by the level of threat posed to them, which is in alignment with the standard protocol of police officers. Yet, in the low-threat scenarios, we found that officers who were more anxious were slower at initiating their actions than officers who were less anxious. Furthermore, we found that officers who were more anxious were less assertive in their communications, gave insufficient warnings, used less proportional force, and were less effective and decisive when using their skills. It is concluded that state anxiety, more than trait anxiety and level of threat, negatively influenced performance. Just as for discrete aiming tasks such as handgun shooting (cf. Nieuwenhuys & Oudejans, 2011; Oudejans, 2008), training under pressure may offer a possible method to become more accustomed to performing under pressure thereby preventing the negative effects of state anxiety on the complex tasks performed by officers on duty.

CHAPTER 5

Police arrest and self-defence skills: Performance under anxiety of officers with and without additional experience in martial arts

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Abstract

We investigated whether officers with additional martial arts training experience performed better in arrest and self-defence scenarios under low and high anxiety and were better able to maintain performance under high anxiety than officers who just rely on regular police training. We were especially interested to find out whether training once a week would already lead to better performance under high anxiety. Officers with additional experience in kickboxing or karate/jiu-jitsu (training several times per week), or krav maga (training once a week) and officers with no additional experience performed several arrest and self-defence skills under low and high anxiety. Results showed that officers with additional experience (also those who trained once a week) performed better under high anxiety than officers with no additional experience. Still, the additional experience did not prevent these participants from performing worse under high anxiety compared to low anxiety. Implications for training are discussed.

Key Words: Anxiety; Deliberate practice; Perceptual-motor skills; Pressure; Skill acquisition

Introduction

Police officers occasionally have to deal with violence during their work. Examples range from slight physical resistance to gun fights. In such situations, officers may experience anxiety, which could negatively affect their performance. Anxiety can be defined as "an aversive emotional and motivational state in threatening circumstances" (Eysenck et al., 2007, p. 336), and is "related to the subjective evaluation of a situation, and concerns jeopardy to one's self-esteem during performance or social situations, physical danger, or insecurity and uncertainty" (Schwenkmezger and Steffgen, 1989, p. 78, 79).

Various experiments have shown that, indeed, anxiety negatively affects officer's performance in handgun shooting (Colin et al., 2014; Nieuwenhuys and Oudejans, 2010, 2011; Nieuwenhuys, Savelsbergh, and Oudejans, 2012; Oudejans, 2008) and arrest and self-defence skills (ASDS; Nieuwenhuys et al., 2009; Renden et al., 2014). For instance, Renden et al. (2014) found that officers performed worse in arrest and self-defence tasks under high anxiety than under low anxiety. One of the tasks officers had to perform in this experiment was to kick back an opponent who attacked them with a knife. When they were attacked with an electrical knife (high-anxiety), they kicked back the opponent less far than when they were attacked with a rubber knife (low-anxiety), probably because they leaned more backwards during kicking.

The changes in behaviour and performance can be explained by the multilevel model of anxiety and perceptual-motor performance by Nieuwenhuys and Oudejans (2012), which relies heavily on attentional control theory (ACT; Eysenck et al., 2007). The model explains that anxiety may negatively affect perceptual-motor performance by causing attention to shift from task-related information towards threat-related information, by causing ambiguous information to be perceived as threatening, or by inducing avoidance behavior (e.g., leaning backwards during kicking to avoid touching a shock knife).

As officers often experience anxiety during violent situations (Anderson, Litzenberger, and Plecas, 2002), optimal preparation for police work would require many hours of training. Still, on a yearly basis, police officers in the Netherlands only have four days available for police training (see Timmer and Pronk [2011] for comparable situations in other EU countries). Because these four days also include exams, theoretical lessons and physical training, there is only four to six hours per year effectively available for officers to train their arrest and self-defence skills (ASDS). As previous research has shown that people need thousands of hours of deliberate practice and hundreds of thousands of repetitions (Crossman, 1959; Ericsson, 2014; Müller and Sternad, 2004) to become expert in perceptual-motor skills, the question arises whether Dutch police officers are sufficiently prepared to manage violence during their work. Moreover, given the established influence of anxiety on officers' performance, it can be expected that officers experience problems in the line of duty.

As more practice leads to more automated skill execution (and reducing attentional resources necessary for skill execution), more training may reduce the negative influence of anxiety on police performance. Although studies on experience and anxiety are scarce, Nibbeling, Oudejans, and Daanen (2012) showed that performance of experienced dart players was not affected by anxiety, while performance of non-experienced dart players was affected. Nibbeling, Oudejans, and Daanen (2012) argued that experienced players were better able to maintain goal-directed attention (as they probably needed less attention to execute the task), which is often impaired under anxiety (Eysenk et al., 2007; Nieuwenhuys and Oudejans, 2012). Less goal-directed attention implies less time for detecting relevant stimuli and linking this to appropriate motor responses (Corbetta, Patel, and Shulman, 2008; Corbetta and Shulman, 2002). Still, whether additional experience also has a positive effect on performance of police officers in high-pressure situations needs to be established.

As time and financial resources for police training are limited, increasing the amount of training to a similar level of that of professional athletes, for instance, is not an option (Timmer and Pronk, 2011). Therefore, in the current experiment we investigated whether officers with additional martial arts training experience (in their leisure time) performed better in ASDS scenarios under low and high anxiety and were better able to maintain performance under high anxiety than officers who just rely on regular police training. We selected officers that trained kickboxing, karate/ jiu-jitsu or krav maga (Israeli self-defence system), respectively, as these are the most common martial arts practiced by officers in their leisure time and at the police training centre. We were especially interested in the group of officers that trained krav maga. These officers had a few years of training experience and trained, on average, once a week to improve their resilience during their work (training once a week would be a 'realistic' increase in training hours). We aimed to examine how they performed in comparison with officers with no additional martial arts experience and with officers who had many years of experience in practicing their martial arts and trained, on average, two or three times a week (kickboxing, karate/ jiu-jitsu). Note that this study was not designed to examine the usability of the different martial arts for police work. We were solely interested in the effect of additional experience on performance under anxiety.

On the basis of previous research, we expected that officers with experience in krav maga would perform better than officers with no additional experience, but less than officers with experience in kickboxing and karate/ jiu-jitsu (Ericsson, 2014). We further expected that anxiety would affect performance of officers with experience in krav maga (Nibbeling, Oudejans, and Daanen, 2012) less than performance of officers with no additional experience (Nieuwenhuys et al., 2009; Renden et al., 2014), but more than performance of officers with experience in kickboxing and karate/ jiu-jitsu.

Method

Participants

A total of 66 police officers (59 men, 7 women) voluntarily took part in the study. 18 officers practiced kickboxing, 14 officers practiced karate or jiu-jitsu,[1] 15 officers practiced krav maga, and 19 officers had no additional experience in martial arts. Characteristics of the groups are presented in Table 5.1. Officers with krav maga experience trained once a week while officers with kickboxing experience and karate experience trained at least twice a week, and had more experience in years. Participants' trait anxiety scores (M = 28.53, SD = 5.70; STAI A-Trait Scale) did not differ among groups, $F(3,62)$ = 1.16, p = .33, and were significantly lower than the norm (i.e., 36.7; t = 12.42; p < .001; Van der Ploeg, 2000), implying that the participants had no extraordinary general tendency to respond to threatening situations with an elevation in state anxiety. Participants provided written informed consent prior to participation, and the experiment was approved by the Ethics committee of the research institute.

Table 5.1. Characteristics of the four experimental groups (SDs between parentheses).

	Kickboxing	Karate/ jiu-jitsu	Krav maga	No martial arts
N	18	14	15	19
Gender (men - women)	15 - 3	14 - 0	15 - 0	15 - 4
Age (years)	30.39 (7.99)	42.14 (11.90)	41.40 (9.65)	38.00 (12.29)
BMI	24.31 (2.46)	25.98 (1.71)	27.02 (3.07)	25.41 (2.42)
STAI	29.06 (5.12)	26.86 (5.91)	26.77 (4.76)	29.84 (6.66)
Working experience (years)	7.81 (5.36)	16.89 (10.78)	18.57 (12.66)	14.29 (13.24)
Experience with violence (1-5)	2.33 (0.49)	2.43 (0.65)	2.40 (0.51)	2.16 (0.83)
Experience with martial arts (years)	7.83 (6.64)	20.93 (10.27)	3.57 (1.80)	0.00 (0.00)
Training hours (per week)	2.18 (1.47)	2.46 (1.25)	1.14 (0.36)	0.00 (0.00)

Task and design

Participants received four different instructions; 'kick', 'punch', 'block' or 'free'. Participants performed a front kick or a direct punch after the instructions 'kick' or 'punch', respectively. After the instruction 'block', they had to react against a haymaker (high block) or a front kick (low block) by the opponent. The participant knew beforehand that these were the possible attacks after the 'block' instruction. However, they still had to 'read' the attack before they acted. After the instruction 'free', they had to react against either a club attack or a tackle attack in any way they saw fit (Figure 5.1). These attacks were not known beforehand, so they had to 'read' the attack and choose the appropriate action altogether. The kick-, punch-, high block- and low block-trials were performed

1 *For reasons of readability, in the remainder of the article we refer to this group as experienced with karate.*

in both the low-anxiety condition (LA) and the high-anxiety condition (HA). The 'free' trials were only announced before, and performed in, the HA condition, as the goal of these trials was to test their ability to improvise and to increase uncertainty and anxiety in the HA condition.

The kick, the punch, the high block and the low block were performed three times within each condition. The same was true for the club attack and the tackle attack in the HA condition. All trials (12 in LA, 18 in HA) were performed in a random order. Thus, the four groups performed the tasks in the LA condition and the HA condition and some tasks only in the HA condition. For the kick, punch and blocks, this led to a 4 (Group) × 2 (Anxiety) design. For the club and tackle attack, this led to a univariate group (4) design. For further descriptions of the conditions, see materials and experimental set-up.

Materials and experimental set-up

The experiment took place in two training dojo's of the police training centre (for details per condition see below). Participants wore a Polar heart rate monitor, shin guards, a groin protector, open-fingered gloves and a boxing helmet during the experiment. Before each trial, they stood on a cross, in a corner, facing a wall (Figure 5.1). The opponent stood behind a line, 2 m from the cross and received the instruction from an experimenter (who pointed towards a piece of paper containing the names of the attacks, see below) before the participant received his or her verbal instruction. While facing the wall, participants received their instruction ('kick', 'punch', 'block', or 'free'). Then they turned around, the opponent approached, and they performed their task. Then, participants turned around, faced the wall again and received their next instruction. During the experiment, two digital video cameras (Creative VADO® HD, Creative, Singapore, 30 Hz, 1200 x 780 pixels) were placed around the setting to record the actions of opponents and participants. Recordings were used for data analysis. Unfortunately, recordings in the LA condition of two participants were damaged so that these were not usable for data analysis. The two participants were excluded from the analyses that concerned the LA-HA comparison, but they were included for the analyses between groups that were done for just the HA condition.

The LA condition took place in the corner of a large 12 x 12 m practice room. Participants kicked and punched on a foam strike field, held by the opponent. During the block-trials, the participants blocked the attack. In the LA condition, the opponent received the following instructions: 'swing' (participant: high block), 'kick' (participant: low block) or 'approach with strike field' (participant: kick or punch). This condition was comparable to the circumstances under which officers normally practice their ASDS. As we used this condition as a baseline measure and to let participants get familiar with the skills, participants always performed the LA condition first.

Figure 5.1: Demonstration of (a) a kick, (b) a punch, (c) a high block, (d) a low block, (e) a club attack and (f) a tackle attack.

The HA condition was situated in a small 5 x 5 m dojo with no windows. Participants put on blinded goggles in the 12 x 12 dojo and were then brought to the 5 x 5 dojo. When they approached the room, the opponent started to bang on the wall and to verbally threaten the participant. Participants performed their skills against an opponent in a so called bullet man suit (Figure 5.1) consisting of several protective items including a pair of stuffed pants, skin, knee and groin protectors, a foam body armour, body, shoulder and elbow protection, gloves and a foam head guard. During the trials, the opponent remained verbally threatening. The opponent received the following instructions: 'attack with electrical knife' (Shockknife®; length: 283 mm) (participant: kick), 'attack with raised fist' (participant: punch), 'swing' (participant: high block), 'kick' (participant: low block), 'hit participant with club' (length 400 mm; a hard tube surrounded with foam) (participant: free), and 'tackle attack' (participant: free). In addition, to examine participants' skills in taking over an attack, they were free to counterattack during the block-trials. An experienced safety coach supervised this condition and ended every trial after approximately three to four seconds by blowing a whistle.

Dependent variables

Manipulation check. To check whether our anxiety manipulation was successful, we assessed participants' subjective ratings of anxiety and mental effort by using two visual-analogue scales: an anxiety scale (i.e. 'the anxiety thermometer', Houtman and Bakker, 1989) and the Rating Scale for Mental Effort [RSME] (Zijlstra, 1993). Both scales have good psychometric properties and were successfully used in earlier experiments (Nieuwenhuys et al., 2009; Renden et al., 2014).

We further used a Polar heart rate monitor to measure average heart rate during conditions. We started recording just before the start of the first trial and finished recording immediately after the last trial. Heart rate is generally assumed to provide a fair indication of anxiety (Åstrand et al., 2003). Still, in this study, differences in physical activity may possibly best account for the differences in average heart rates between conditions.

Performance. From video recordings, an experienced police instructor assessed performance of the kick, punch and both blocks in the LA condition and of the kick, punch, both blocks, both free tasks, and first counterattacks (in the block and club attack trials) in the HA condition on a 5-point Likert scale. This method was used successfully to assess ASDS performance in Nieuwenhuys et al. (2009) and Renden et al. (2014). As a reliability check, two other police instructors also assessed performance on all tasks of 12 participants. Inter-rater reliability was assessed using Kendall's *W*. Results showed satisfactory inter-rater reliabilities (Van Rossum and Gagné, 1994) in the LA condition: kick, .96, punch, .84, high block .89, low block, .82, and in the HA condition: kick, .88, punch, .71, high block .85, low block, .88, club attack, .65, tackle attack, .81, counterattacks, .78.

Procedure

At the start of the experiment, participants received information about the general purpose of the experiment and they provided written informed consent and completed the STAI. Next, they put on their heart rate monitor and their protection gear. Then, they received general instructions, practiced the four tasks of the LA condition once, and took position on the cross facing the wall. The LA condition started when participants received their first instruction and turned around to face the opponent. After the LA condition, participants rated their perceived anxiety and mental effort as experienced during the condition. Then, they took off their helmet, put on the blinded goggles and had to wait for two minutes. The experimenters used these two minutes to bring the cameras to the other dojo, to place them in the correct position and to help the opponent put on his head guard. After the two minutes, participants were brought into the second dojo and positioned on the cross with their face to the wall. They took of their goggles and put on their helmet again. Then, the HA condition started when participants received their first instruction and turned around to face the opponent. After the HA condition, participants again rated their perceived anxiety and mental effort as experienced during the condition.

Data analysis

4 (Group: Kickboxing, Karate, Krav maga, No martial arts) × 2 (Anxiety: LA, HA) ANOVAs were performed with Group as the between-subjects factor and Anxiety as the within-subjects factor. The 4 × 2 ANOVAs were performed on anxiety scores, mental effort scores, heart rates and average performance LAHA (performance scores averaged over kick, punch, high and low block per group and per condition). 4 × 2 ANOVAs were also performed on separate performance scores for the kick, punch, high block and low block. Furthermore, we performed univariate ANOVAs for the tasks only performed in the HA condition, with Group as the between-subjects factor. Univariate ANOVAs were performed on average performance HA (performance scores averaged over club attack, tackle attack and counterattacks), and on the separate scores for the club attack, tackle attack and counterattacks. Whenever appropriate, we performed post-hoc pairwise comparisons using Bonferroni corrections. The alpha level for significance was set at .05. Effect sizes were calculated using Cohen's f with 0.2 or less, about 0.3 and 0.4 or more, representing small, moderate and large effects, respectively (Cohen, 1988). All analyses were performed in SPSS 20.0 (IBM SPSS, IBM Corp, Somers NY).

Results

Mean anxiety scores, mental effort scores, heart rates and performance scores per group are presented in Table 5.2. Because the statistics of the separate tasks generally follow the average trend and for reasons of readability in this section, we only discuss the results of the manipulation checks, average performance LAHA and average performance HA

(see also Figure 5.2 and 5.3). Full statistics are presented in Table 5.3. Table 5.4 presents the *p*-values from the posthoc pairwise comparisons per group per skill.

Table 5.2. Mean anxiety (1-10), mental effort scores (1-150), heart rate (bpm), and performance scores (1-5) for officers per group in the low- and high-anxiety condition (SDs between parentheses).

	Kickboxing		Karate/ jiu-jitsu		Krav maga		No martial arts	
	LA	HA	LA	HA	LA	HA	LA	HA
Manipulation								
Anxiety score	2.19 (1.48)	5.06 (2.40)	3.61 (2.18)	5.80 (1.99)	2.38 (2.03)	4.61 (2.64)	3.34 (2.21)	5.73 (2.17)
Mental effort score	33.72 (15.63)	60.94 (27.14)	40.79 (23.76)	66.57 (24.14)	36.53 (22.13)	53.80 (26.54)	52.00 (21.83)	68.05 (17.82)
Heart rate	138.62 (17.35)	158.00 (13.58)	125.11 (28.19)	152.56 (20.56)	123.29 (14.03)	153.71 (13.36)	133.00 (14.87)	156.94 (19.06)
LA								
Kick	4.77 (0.36)	4.02 (0.74)	4.60 (0.71)	3.92 (0.67)	4.19 (0.61)	3.48 (0.91)	4.07 (0.60)	3.28 (0.40)
Punch	4.87 (0.18)	4.06 (0.57)	4.71 (0.45)	3.93 (0.72)	4.24 (0.62)	3.50 (0.47)	4.11 (0.50)	3.09 (0.77)
High block	4.43 (0.64)	3.90 (0.70)	4.62 (0.41)	4.07 (0.64)	4.55 (0.38)	3.52 (0.59)	3.99 (0.60)	3.37 (0.58)
Low block	4.04 (0.74)	3.61 (0.73)	3.88 (0.83)	3.64 (0.53)	3.67 (0.63)	3.24 (0.63)	3.35 (0.63)	2.63 (0.67)
Average performance LAHA	4.53 (0.37)	3.90 (0.56)	4.45 (0.51)	3.89 (0.44)	4.17 (0.45)	3.43 (0.51)	3.88 (0.41)	3.09 (0.48)
HA only								
Club attack		3.70 (0.77)		3.52 (0.78)		3.54 (0.72)		2.85 (0.47)
Tackle attack		3.58 (0.62)		3.52 (0.62)		3.18 (0.40)		2.75 (0.49)
Counter attacks		3.71 (0.56)		3.75 (0.45)		3.19 (0.37)		2.75 (0.43)
Average performance HA		3.66 (0.58)		3.61 (0.51)		3.30 (0.40)		2.79 (0.34)

Manipulation check

There were no significant interactions between anxiety and group for perceived anxiety, mental effort or heart rate, $F(3,62) = 0.81$, $p = .65$, $F(3,62) = 1.14$, $p = .34$, $F(3,41) = 1.25$, $p = .31$. Furthermore, there were no main effects for group, $F(3,62) = 1.56$, $p = .21$, $F(3,62) = 1.14$, $p = .34$, $F(3,41) = 0.84$, $p = .48$. Yet, participants did report higher levels of perceived anxiety and mental effort and also had higher heart rates in the HA condition than in the LA condition, $F(1,62) = 130.01$, $p < .001$, $f = 1.46$, 95% CI [2.00, 2.84], $F(1,62) = 61.46$, $p < .001$, $f = 1.00$, 95% CI [16.08, 27.09], $F(1,41) = 145.80$, $p < .001$, $f = 1.88$, 95% CI [21.07, 29.53], respectively (see Table 5.2). Note that higher heart rates in the HA condition were probably caused (besides possibly by more anxiety) by more physical effort such as more trials, longer trials and performing counterattacks. Still, together the results show that the anxiety manipulation was successful.

Average performance LAHA

The ANOVA on performance averaged over kicks, punches, and high and low blocks showed no significant interaction (see Table 5.3 for statistics). However, there was a significant main effect for anxiety, indicating that performance of all groups was worse in the HA condition than in the LA condition (see Figure 5.2). There was also a main effect for group. Posthoc pairwise comparisons revealed that participants with kickboxing experience performed significantly better than participants with krav maga experience, $p < .05$, 95% CI [0.25, 0.81], and with no martial arts experience, $p < .001$, 95% CI [0.36, 1.09]. Participants with karate experience also performed better than participants with no martial arts experience, $p < .001$, 95% CI [0.30, 1.07], but not significantly better than participants with krav maga experience, $p = .10$. There was no significant difference in performance between participants with kickboxing experience and karate experience, $p = 1.00$, nor between participants with krav maga experience and with no martial arts experience, $p = .19$. Thus, participants with kickboxing and karate experience performed clearly better than participants with no martial arts experience. However, participants with krav maga experience did not perform significantly better than participants with no martial arts experience, but also not significantly worse than participants with karate experience who had much more experience.

Table 5.3. Results of the 4 (Group: Kickboxing, Karate, Krav maga, No martial arts) × 2 (Anxiety: LA, HA) ANOVAs on performance per skill. Significant results are shown in bold.

	Anxiety	Group	Anxiety x Group Interaction
Kick	**$F(1,60) = 79.50, p < .001, f = 1.15, 95\%$ CI [0.57, 0.90]**	**$F(3,59) = 4.53, p < .01, f = 0.48$**	$F(3,60) = 0.09, p = .97$
Punch	**$F(1,60) = 115.21, p < .001, f = 1.39, 95\%$ CI [0.68, 0.96]**	**$F(3,60) = 12.62, p < .001, f = 0.80$**	$F(3,60) = 0.68, p = .57$
High block	**$F(1,60) = 50.87, p < .001, f = 0.92, 95\%$ CI [0.49, 0.88]**	**$F(3,60) = 6.81, p < .01, f = 0.58$**	$F(3,60) = 1.42, p = .25$
Low block	**$F(1,60) = 20.68, p < .001, f = 0.59, 95\%$ CI [0.26, 0.66]**	**$F(3,60) = 7.73, p < .001, f = 0.62$**	$F(3,60) = 1.01, p = .39$
Average performance LAHA	**$F(1,60) = 127.03, p < .001, f = 1.46, 95\%$ CI [0.56, 0.80]**	**$F(3,60) = 12.56, p < .001, f = 0.80$**	$F(3,60) = 0.72, p = .55$
Club attack		**$F(3,62) = 5.55, p < .01, f = 0.52$**	
Tackle attack		**$F(3,62) = 8.83, p < .001, f = 0.65$**	
Counterattacks		**$F(3,62) = 19.30, p < .001, f = 0.94$**	
Average performance HA		**$F(3,62) = 13.27, p < .001, f = 0.80$**	

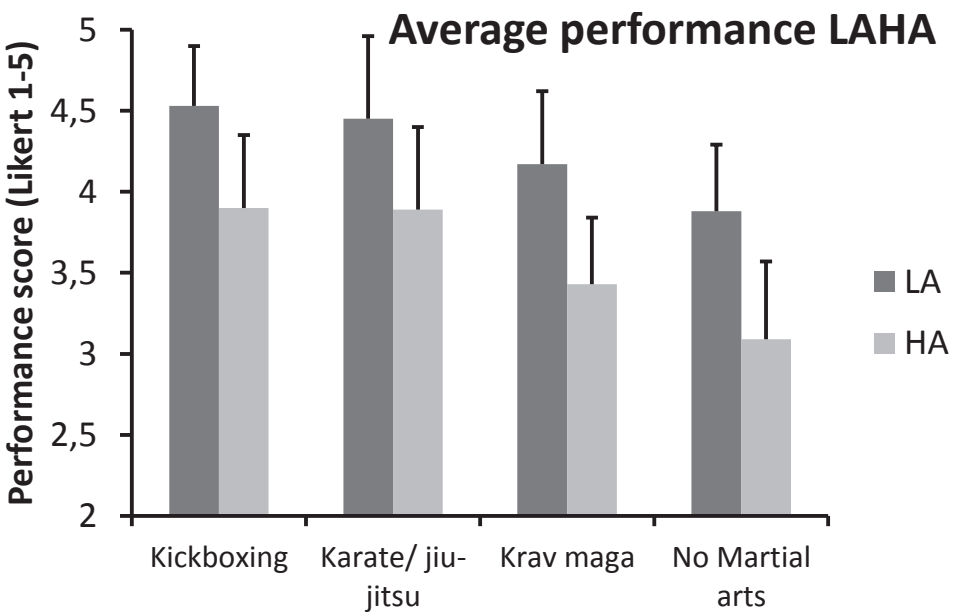

Figure 5.2. Performance scores averaged over kick, punch, high and low block per group and per condition.

Table 5.4. *p*-Values from the posthoc pairwise comparisons between groups on performance scores per task. Significant *p*-values are shown in bold.

Groups	Comparison group	Kick	Punch	High block	Low block	Club attack	Tackle attack	Counters
Kickboxing	Karate/ Jiu-Jitsu	$p = 1.00$	$p = 1.00$	$p = 1.00$	$p = 1.00$	$p = 1.00$	$p = 1.00$	$p = 1.00$
	Krav Maga	**$p < .05$**	**$p < .05$**	$p = 1.00$	$p = .53$	$p = 1.00$	$p = .21$	**$p < .05$**
	No Martial arts	**$p < .01$**	**$p < .001$**	**$p < .05$**	**$p < .01$**	**$p < .01$**	**$p < .001$**	**$p < .001$**
Karate/ Jiu-Jitsu	Krav Maga	$p = .27$	$p = .08$	$p = .39$	$p = 1.00$	$p = 1.00$	$p = .55$	**$p < .05$**
	No Martial arts	**$p < .05$**	**$p < .001$**	**$p < .001$**	**$p < .001$**	**$p < .05$**	**$p < .01$**	**$p < .001$**
Krav Maga	No Martial arts	$p = 1.00$	$p = .63$	$p = .18$	$p = .14$	**$p < .05$**	$p = .16$	**$p < .05$**

Average performance HA

The ANOVA on performance averaged over the club, tackle, and counter attacks in the HA condition showed a significant main effect for group (see Table 5.3 for statistics per skill). Posthoc pairwise comparisons revealed that participants with kickboxing experience, karate experience and krav maga experience performed significantly better than participants with no martial arts experience, $p < .001$, 95% CI [0.46, 1.30], $p < .001$, 95% CI [0.37, 1.26], $p < .05$, 95% CI [0.08, 0.96], respectively (see Table 5.2 and Figure 5.3). There were no significant differences in performance between participants with kickboxing experience and those with karate experience or krav maga experience, $p = 1.00$, $p = .19$, respectively. There was also no significant difference between participants with karate experience and krav maga experience, $p = .55$. As can be seen

in Figure 5.3, participants with no martial arts experience scored on average below 3, which is insufficient performance. Thus, for the tasks that were only performed in the HA condition, participants with krav maga experience performed significantly better than participants with no martial arts experience, and not significantly worse than participants with kickboxing or karate experience.

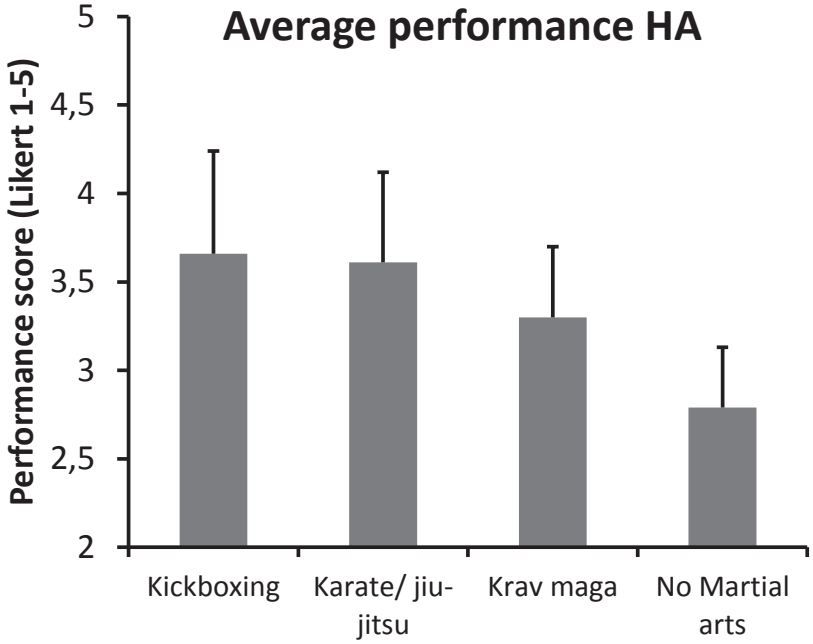

Figure 5.3. Performance scores averaged over club attack, tackle attack and counterattacks.

Discussion

The aim of the present study was to investigate whether officers with additional martial arts training experience (in their leisure time) performed better in ASDS scenarios under low and high anxiety and were better able to maintain performance under high anxiety than officers who just rely on regular police training. The most direct examination of whether a 'realistic' increase in training hours would lead to better performance, especially under anxiety, was the comparison of performance between officers with krav maga experience and officers with no additional experience, as the officers with experience in krav maga only had a few years of experience and trained once a week. A comparison between the two groups showed that there was no difference in performance for the tasks that were executed in both the LA condition and HA condition. However, for the tasks that were only performed in the HA condition, officers with experience in krav maga performed better than officers with no martial arts experience. This result indicates that increasing officers' training frequency may lead to better performance under anxiety. Moreover, there were no significant differences between officers with krav maga

experience and karate experience, and with kickboxing experience in the HA condition, while these officers had much more training experience. Further analyses showed that, irrespective of their training experience, officers performed significantly worse under high anxiety than under low anxiety.

Thus, although performance of officers with krav maga experience was not significantly better than performance of officers with no martial arts experience for the tasks that were performed in both conditions, it was better for the tasks that were performed only in the HA condition. Recent expertise studies have found that advantages of more experienced participants are maximised in conditions that are closely related to competitive contexts (Mann et al., 2010; Müller et al., 2009), which may explain the absence of significant differences between officers with krav maga experience and officers with no additional experience for the tasks that were executed in both conditions (and why officers pass their ASDS exam, but still may experience problems on duty). For the tasks that were only executed in the HA condition, officers needed to anticipate the opponent's intentions and self-initiate their actions, which is also the case in the line of duty**.** More experience often leads to better anticipation of opponents' intentions because they are better able to pick up essential information (in a short period of time) for effective performance than their less-skilled counterparts (Savelsbergh et al., 2002; Ward, Williams, and Bennett, 2002). Thus, our results indicate that training once a week may lead to a higher level of skill in threatening circumstances.

However, against our expectations, additional experience with martial arts did not prevent that performance was affected by anxiety. Although additional experience led to better performance in the HA condition, performance was similarly affected in the four groups. Nieuwenhuys and Oudejans (2012) explain that anxiety affects performance as anxiety draws attention towards treat-related sources of information at the cost of task-related information (goal-directed attention) (see also ACT; Eysenk et al., 2007). This explanation is confirmed by several experiments concerning anxiety and police performance (Nieuwenhuys and Oudejans, 2010, 2011; Nieuwenhuys, Savelsbergh, and Oudejans, 2012). Thus also for officers with additional experience, attention was probably to some degree drawn to threat-related sources of information. Cognitive accounts of anxiety and performance show that with more anxiety, activation of the amygdala increases, which is related to decreases in the activation of prefrontal control mechanisms (Bishop et al., 2004; Bishop, Duncan, and Lawrence, 2004). This generally means that it is harder to pay attention to task-relevant information (goal-directed attention) under high anxiety (Nieuwenhuys, Savelsbergh, and Oudejans, 2012), which generally results in worse performance. So even though officers with additional experience were probably better in maintaining a certain level of goal-directed attention under high anxiety (Corbetta, Patel, and Shulman, 2008; Corbetta and Shulman, 2002), their lower performance indicates that they were still affected.

Therefore, it may be useful for officers to get used to performing under anxiety, so that they become better able to maintain goal-directed attention in such situations (cf. Nieuwenhuys and Oudejans, 2011). Bernstein (1996), an important pioneer in the areas of motor control and motor learning, argued that for a stable performance, it is necessary to accumulate experience with performing skills under complicated circumstances. Moreover, he states that time and effort are wasted when someone trains movements only in a simple, rhythmical way. In that case, the only probable outcome that will happen when someone applies the trained skill in real conditions is deautomatisation, which leads to decreases in performance. Thus besides training a sufficient number of hours, it is important that officers are also confronted with varying situations (and accompanying levels of anxiety) that could occur in the line of duty (Bernstein, 1996). As an example, Nieuwenhuys and Oudejans (2011) found that training with a certain level of threat (i.e., officers and suspects shot with coloured soap cartridges) at realistic locations (e.g., a shopping street, a home) helped officers to maintain handgun shooting performance in threatening circumstances (see also Oudejans, 2008; Oudejans and Pijpers, 2009, 2010). Whether such trainings would lead to similar positive effects for ASDS remains to be determined (see also Duke, Simmons, and Cash, 2009, Van Rossum, 2000 and Ward et al, 2007, for more evidence that training strategy is an important contributor to performance).

Note that several limitations should be kept in mind. First, the unbalanced gender distribution among groups (see Table 5.1) may limit the extent to which our findings can be generalised, especially because we were most interested in the comparison between officers with krav maga experience (15 men, 0 women) and officers with no additional experience (15 men, 4 women). However, we performed additional analyses on average performance LAHA and HA of only the male participants. This led to a similar pattern of results.

Second, our groups also differ on age, working experience, and BMI, which may have affected the comparisons between groups. Yet, the officers with krav maga experience were on average older and had a higher BMI than officers with no additional experience. Therefore, if anything, these characteristics would have had a negative effect on performance of the officers with krav maga experience in comparison with officers with no additional experience.

Third, the differences in characteristics among participants of the three martial art groups make it impossible to draw conclusions about differences in effectiveness of the martial arts for police work. The officers were mainly included to examine whether a certain degree of extra training experience would lead to better performance under anxiety. Furthermore, martial arts techniques are developed for use in competitions and not on the street. Therefore, it is not certain whether such skills are also effective (or proportional) for officers in the line of duty. Thus, our results are not suitable to draw conclusions about the usability of any particular martial arts skill during police work.

More research is needed to find out whether the current set of ASDS can be improved in terms of usability in the line of duty.

To conclude, our results indicate that training one hour on a weekly basis may already increase officers' performance in threatening circumstances. More experience will probably lead to better anticipation of others' intentions and self-initiation of actions, which is most important in the line of duty. Still, although more experience seemed to benefit performance under threat, more experience did not prevent officers with additional experience from performing worse under high anxiety. Therefore, next to training more frequently, results from previous studies (Nieuwenhuys and Oudejans, 2011; Oudejans, 2008) indicate that officers' performance in threatening circumstances on duty may also benefit from training ASDS under higher levels of anxiety.

CHAPTER 6

Effects of reflex-based self-defence training on police performance in high-pressure arrest situations

Renden, P.G., Savelsbergh, G.J.P., & Oudejans, R.R.D. (Submitted). Effects of reflex-based self-defence training on police performance in high-pressure arrest situations.

Abstract

We investigated the effects of reflex-based self-defence training on police performance in high-pressure arrest situations. Police officers received this training as well as a regular police arrest and self-defence skills training (control training) in a cross-over design. Officers' performance was tested on several variables in six realistic scenarios before, between and after the two trainings. Results showed improved performance after the reflex-based training, while there was no such effect of the regular police training. Improved performance could be attributed to better communication, alertness, assertiveness, resolution, and converting primary responses into tactical movements. As officers were taught to anticipate on possible attacks and to respond with skills based on their primary reflexes, they were better able to perform effectively. These results seem to suggest that reflex-based self-defence training better prepares officers for performing in high-pressure arrest situations than the current form of police arrest and self-defence skills training.

Key Words: Anxiety; Flinch; Resilience; Stress; Threat

Introduction

Police officers regularly have to perform arrest and self-defence skills (ASDS) during their work, for instance, when a person aggressively insults an officer, resists arrest, or starts fighting with an officer. In preparation for such situations, officers train a fixed set of ASDS and they have to pass an ASDS exam each year (cf. Nieuwenhuys et al., 2009). Besides the yearly exam, officers receive two or three practice days (including theory, handgun shooting, ASDS training) resulting in about four to six hours of ASDS training per year (see Timmer and Pronk, 2011 for comparable situations in other EU countries).

The four to six hours training per year seem hardly sufficient to perform well in the line of duty (cf. Ericsson, 2014). Moreover, officers often experience anxiety during violent situations (Anderson, Litzenberger, and Plecas, 2002), which has been shown to have negative effects on officers' performance (e.g., Nieuwenhuys and Oudejans, 2010; Oudejans, 2008; Renden et al., 2014). To counter these negative influences, researchers have proposed more training as well as more reality-based training (cf. Renden et al., 2015). Previous research has shown that more training experience (i.e., officers practiced martial arts in their leisure time) results in better performance, but also that negative effects of anxiety are difficult to prevent by more training only (Renden et al, in press). Training in realistic scenarios, especially with increased levels of threat and anxiety, has been shown to hold much promise in improving performance under pressure in discrete far aiming tasks such as handgun shooting (Nieuwenhuys and Oudejans, 2011; Oudejans, 2008; see also Oudejans and Pijpers, 2009, 2010, for examples in dart throwing and basketball shooting). The questions that arise are whether and how ASDS performance under pressure can be increased with specifically designed reality-based practice.

The current ASDS, such as punching and kicking, but also the more complex control techniques, find their origin in sports where they are well-learned and rehearsed over and over again. However, they may be less suitable for police officers who lack the time to sufficiently practice these skills. As mentioned, ASDS are often not well-learned and only acquired on the basis of limited training, making them quite vulnerable to performance breakdown under pressure and anxiety during threatening situations (cf. Nibbeling, Oudejans, and Daanen, 2012). It has been shown that anxiety increases amygdala activation (emotion centre in the brain), which at the same time decreases prefrontal control mechanisms (Bishop et al, 2004; Bishop, Duncan, and Lawrence, 2004). When the amygdala detects the presence of an environmental threat, its output could lead to initiations of stress responses such as flinching (Blanchard and Blanchard, 1969; Fendt and Fanselow, 1999). The decrease of prefrontal control in combination with activation of primary (gross motor) reflexes makes it more difficult to perform skills existing of finer motor sequences such as ASDS.

To improve ASDS performance in threatening situations, it seems more appropriate to train skills that are compatible with primary (gross motor) reflexes that are controlled at lower levels of the central nervous system and therefore more robust to performance breakdown due to anxiety (see Bernstein, 1996; Beek, 2000 for a theoretical account supporting this suggestion). One of the primary gross motor reflexes that almost always occurs when people encounter sudden threat is the flinch response (Figure 6.1). The flinch response is a scare up reaction that occurs naturally in response to sudden threatening events. This response is controlled at a lower level of control than the regular ASDS and does not involve prefrontal control mechanisms. It just happens, whereby it is a highly reliable reflex-like response that functions as an effective protection mechanism (Cobb and Pincus, 2003). As such, it may form a more suitable basis for performing arrest and self-defence skills on duty than the current set of ASDS. It is a robust response also with high levels of anxiety.

The aim of the current study was to investigate the effects of reflex-based self-defence training on police performance in arrest situations. To that aim, and using a cross-over design, police officers received a training based on the training methodology of FIRST™ (Functional Intuitive Replication Scenario Training) as well as a control training in the form of a regular ASDS training. The FIRST training consisted of two main components: recognition of and anticipating on potential danger and effective use of the flinch response. ASDS are never performed in isolation but mostly in complex threatening situations in a sequence of actions leading to, for instance, the arrest of a suspect (Renden, Landman, Daalder et al., in press). Still, the current ASDS training mostly focuses on the execution of certain isolated police skills, such as punching, kicking, and control techniques, while reading a certain situation and recognizing signals of potential aggression and possibly an imminent attack are just as important on duty. As such, it seems of high relevance to focus on the recognition of signals of a possible attack (anticipation) and to respond with skills that are compatible with primary reflexes such as the flinch response. As the flinch response is controlled at a lower level of the central nervous system and occurs without conscious initiation, it may form a more suitable basis for ASDS than the current set of arrest and self-defence skills, particularly in threatening situations. Therefore, we expected that after the FIRST training officers would perform better in a series of reality-based scenarios involving different types of aggression. Because officers are used to regular ASDS training, we expected that this training would not affect performance.

Figure 6.1. A flinch response.

Method

Participants

Twelve participants participated in the experiment. Due to injury (unrelated to this study), 11 participants finished the experiment. Participants were randomly divided into two groups. Six participants (FIRST/ASDS group: 5 men, 1 woman; *M* age = 38.83, *SD* = 9.06; *M* working experience = 16.58, *SD* = 9.37) received the FIRST training first and later the ASDS training. Five participants (ASDS/FIRST group: 3 men, 2 women; *M* age = 38.83, *SD* = 9.06; *M* working experience = 16.58, *SD* = 9.37) received the ASDS training first and later the FIRST training. Participants' trait anxiety scores (FIRST/ASDS: *M* = 34.00, *SD* = 3.39, ASDS/FIRST: *M* = 28.00, *SD* = 5.02; STAI A-Trait Scale) were significantly lower than the norm (i.e., 36.7; $t = 22.42$; $p < .001$, $t = 13.66$, $p < .001$; Van der Ploeg, Defares, and Spielberger, 1980) indicating that the participants had no extraordinary tendency to respond to threatening situations with an elevation in state anxiety. Participants provided written informed consent prior to participation, and the experiment was approved by the ethics committee of the research institute.

Design

We used a 2 (group) × 3 (test) cross-over design. Participants first performed in the Pre-test. Subsequently, they received their first training (FIRST or ASDS), performed Post-test 1, received their second training, and performed Post-test 2. Because of practical reasons, the Pre-test and the first training were sometimes performed on the same day, as were Post-test 1 and the second training. However, tests after a training were

never performed on the same day as the training. The average number of days between training and the later tests was 4.82 days (*SD* = 2.75).

Materials and experimental set-up

Test sessions. The test sessions were performed in a 'practice street' (with a bar, a home, parked cars, etc.) at a police training centre. Participants received a short briefing about the situation, and were further instructed to act as they would normally do during work (they were also dressed as usual and they had their regular police training tools with them). In each test session they performed in six different settings: "passive aggressive", "pushing", "push and swing", "tackle on the body", "knife attack" (Shocknife®; length: 283 mm), "handgun attack" (dummy handgun Walther P99Q-NL; 180 mm × 135 mm). In the passive aggressive scenarios, the suspect behaved verbally aggressive and indicated that he did not want to cooperate. The participant had to physically control and handcuff the suspect. In the pushing scenarios, the suspect was also physically aggressive. He kept pushing until the participant had physical control and handcuffed him. In the scenarios with a push and swing and with a tackle on the body, there first was a conversation between participant and suspect. Then, at a certain point, the suspect initiated the attack. The participant had to anticipate the attack and physically control the suspect. The scenarios with an armed attack (knife or handgun) were similar, but instead of a physical attack, the suspect used a weapon for the attack. The participant had to act such that the danger was undone as soon as possible.

The scenarios were different each test session (e.g., domestic violence, shoplifter, drunken driver), but the six settings were always the same (order was randomised). As an example, in the scenarios with a tackle on the body, the suspect sat on a chair. In the Pre-test, the suspect sat on a chair in a bar, was drunk and refused to leave, even though it was closing time. In Post-test 1, the suspect sat in his car and he was requested to come to the police station for further alcohol testing. In Post-test 2, the suspect sat on a chair in a room of a super market and was picked up by an officer for shoplifting. In all three scenarios, there was a discussion between participant and suspect. The suspect was ordered to come with the participant, but he refused. Instead, he attacked the participant with a tackle on the body.

Training sessions. In Training 1, participants received a FIRST training or an ASDS training. This was reversed in Training 2. Both trainings lasted 90 minutes. It is important to note that the FIRST and ASDS training differed in several regards and were experimentally not well comparable. However, the aim of this study was not to compare the two trainings, but to examine the effect of reflex-based self-defence training in comparison with the current training policy. The ASDS training was therefore used as a control training. It consisted of practicing the skills that are tested each year in the ASDS exam, including kick and punch exercises on a foam strike field, different control

exercises and handcuff exercises with different levels of resistance, transition from pepper spray to handgun and effective use of pepper spray and handgun.

The FIRST training consisted of a meeting in a classroom and physical exercises in a training room. In the classroom, the trainer explained the flinch response, how it emerges, and how it can be used effectively during violent situations (see below). Furthermore, the trainer and participants spoke about the recognition of imminent violence and how to anticipate on a possible attack and a possible occurring flinch response. Then, this was physically trained during the physical exercises. The training focussed on using primary physical responses against physical or weapon attacks. The primary response to a physical attack is to protect the face with the arms up (elbows bent) and to push away the danger. Participants were taught, if they sensed that the situation could get dangerous, to move towards the suspect (to decrease his movement space)[1] and to keep their hands between them and the suspect so that their flinch response could be used as effectively as possible in case of an attack. As a follow-up, participants were taught to keep their fingers spread (as that generates most power) and to use pushing force towards a wall, car, chair or floor, depending on the scenario.

In case of a knife attack, the primary response is to move the body away from the knife and to hit the arm (holding the knife) of the suspect away. Participants were taught to 'let that happen' and as a follow up to grab the arm of the suspect, and to counter the attack by pushing the suspect towards, for instance, a wall or the floor, or to take their handgun and fire. The same principle was used for an attack with a handgun.

Dependent variables

Evaluation of training. Participants rated both trainings on entertainment, usefulness, and applicability on duty on a 5-point Likert scale. A higher score on the scale indicates more entertainment, usefulness, or applicability on duty.

Anxiety. To check whether participants experienced the scenarios as threatening, we assessed participants' subjective ratings of anxiety and mental effort after each scenario by using two visual-analogue scales: an anxiety scale (i.e. 'the anxiety thermometer', Houtman and Bakker, 1989) and the Rating Scale for Mental Effort [RSME] (Zijlstra, 1993). Both scales have good psychometric properties and were successfully used in earlier experiments (e.g., Nieuwenhuys et al., 2009; Renden et al., 2014).

We further used a Polar heart rate monitor to measure average heart rate during the scenarios. For each scenario we started recording after participants received their

1 *This experiment focussed on situations in which an officer received a call and approached a (possible) suspect. Their conversation could possibly build up towards aggression and an attack. In such situations, when an officer senses that it could get dangerous, moving forward is most of the times an effective approach. Other situations might need another approach. For instance, as an officer receives a call with the information that a suspect walks around with a knife, it is best to keep a safe distance.*

instruction and finished recording immediately after the scenario. Heart rate is generally assumed to provide a fair indication of anxiety (Åstrand et al., 2003). Still, in this study, physical activity in the scenarios may possibly best account for the differences and changes in heart rate.

Performance. From video recordings, an experienced instructor assessed performance in the scenarios on a 5-point Likert scale. A higher score on the scale indicates better performance. This method was used successfully to assess ASDS performance in Nieuwenhuys et al. (2009) and Renden et al. (2014). Besides overall performance, performance was assessed on several other variables (see below). To do so, the scenarios were divided in a pre-contact phase (before there was physical contact with the suspect) and a contact phase. In addition, a number of technique variables in the contact phase were assessed on effectiveness. As a reliability check, two police instructors (unrelated to the experiment and to the FIRST methodology) also assessed performance on all variables for 30 scenarios. We made sure that each participant was represented and that the Pre-test, Post-test 1 and Post-test 2 as well as the six scenarios were equally distributed. Inter-rater reliability was assessed using Kendall's *W* showing a satisfactory inter-rater reliability for overall performance, $W(29) = .70$ (Van Rossum and Gagné, 1994). In addition, average Kendall's *W* was .64 for the variables in the pre-contact phase (range: .52 - .79), .66 for the variables in the contact-phase[2] (range: .55 - .82), and .74 for the technique variables (range: .67 -. 82).

Pre-contact phase. The following variables assessed officers' actions before there was physical contact between the officer and the suspect.

Communication. The participant communicated in a clear, assertive and functional way, without being aggressive.

Alertness. The participant was aware of the situation and able to detect important signals from the suspect.

Assertiveness. The participant was clear about what he or she wanted from the suspect and what the suspect was allowed and not allowed to do.

Active posture. The participant showed an active posture; he or she was ready to intervene if necessary and displayed that.

Positioning. The participant moved forward and displayed being in charge of the situation.

Contact phase. The following variables assessed officers' actions during physical contact between the officer and the suspect.

Communication. The participant communicated in a clear, assertive and functional way during the physical confrontation.

Resolution. The participant performed in a resolute and functional way.

2 *For proportionality, the scores for these 30 situations was mostly 5, which resulted in too many ties (26 5's per rater) to calculate a reliable Kendall's W.*

Proportionality. The participant used force in proportion to the behaviour of the suspect.
Scan area. The participant scanned the area during the physical confrontation to remain aware of the surroundings.
Control before handcuffing. The participant had control over the suspect before he or she started handcuffing.
Technique variables. The following variables assessed officers' skills during the scenarios.
Use of flinch response. The participant effectively used the flinch response (when appropriate).
Extension power. The participants used extension power (pushing).
Flexion power. The participant used flexion power (pulling).
Effectiveness verbal skills. The used verbal skills were effective.
Effectiveness physical skills. The used physical skills were effective.
Effectiveness response against an armed attack. The used response was effective.

Procedure

Test sessions. Before the Pre-test, participants received general information about and instructions for the test sessions. Before all test sessions, officers put on a heart rate monitor and received practice pepper spray, practice handcuffs, and a dummy handgun. Then, they performed the six scenarios. After each scenario, participants rated their perceived anxiety and mental effort.
Training sessions. Both training sessions took place in a practice room of the police training centre, with exception of the classroom meeting of the FIRST session. Training sessions took place with a minimum of two and a maximum of four participants and one instructor who also acted as a suspect when participants practiced their skills. After each training session, participants separately assessed training on entertainment, usefulness, and applicability on duty.

Data analysis

To compare the evaluations of the FIRST and ASDS training, we performed paired sample *t*-tests. Effect sizes were calculated using Cohen's *d* with 0.20 or less, about 0.50, and 0.80 or more, representing small, moderate, and large effects, respectively (Cohen, 1988). To compare the differences between groups and among tests on anxiety and performance, we performed 2 (Group) × 3 (Test). Repeated Measures ANOVAs with Group as the between-subjects factor and Test as the within-subjects factor. Whenever appropriate, we performed post-hoc pairwise comparisons using Bonferroni corrections. The alpha level for significance was set at .05. Effect sizes were calculated using Cohen's *f* with 0.2 or less, about 0.3 and 0.4 or more, representing small, moderate and large effects, respectively (Cohen, 1988).

Results

Evaluation of training

Participants rated both trainings above 4 on entertainment (*M* FIRST = 4.82, *SD* = 0.40; *M* ASDS = 4.09, *SD* = 0.54), usefulness (*M* FIRST = 4.82, *SD* = 0.40; *M* ASDS = 4.36, *SD* = 0.67), and applicability on duty (*M* FIRST = 4.45, *SD* = 0.69; *M* ASDS = 4.18, *SD* = 0.75), but the FIRST training scored significantly higher on entertainment and nearly significantly higher on usefulness, $t(10) = 3.73$, $p < .01$, $d = 1.55$, $t = 2.19$, $p = .053$. There was no significant difference on applicability on duty, $t = 1.40$, $p = .19$. These results indicate that participants considered both trainings as entertaining, useful and applicable on duty.

Anxiety

The average anxiety scores (see Table 6.1) showed that anxiety scores were relatively high[3] (see Renden et al., 2014 for comparable scores in high anxiety scenarios), indicating that participants experienced the scenarios as threatening. The 2 (Group) × 3 (Test) ANOVA on anxiety scores showed a significant interaction between group and test, $F(2,18) = 4.56$, $p < 05$, $f = 0.77$. Posthoc pairwise comparisons showed that participants in the ASDS/FIRST group rated their anxiety higher in the Pre-test than in Post-test 2, $p < .01$, 95% CI [0.46, 3.00]. Still, in Post-test 2, their anxiety scores were relatively high and comparable with the anxiety scores of the FIRST/ASDS group. Posthoc pairwise comparisons showed no other significant differences. In addition, there were no significant main effects for group or test or significant interaction effects for mental effort, $F(1,9) = 0.39$, $p = .55$, $F(2,18) = 0.33$, $p = .72$, $F(2,18) = 2.22$, $p = .14$, and heart rate, $F(1,9) = 1.29$, $p = .29$, $F(2,18) = 0.66$, $p = .53$, $F(2,18) = 0.62$, $p = .55$.

Table 6.1. Mean anxiety, mental effort, and heart rate (and SDs) per group per test.

	FIRST/ASDS			ASDS/FIRST		
	Pre-test	Post-test 1	Post-test 2	Pre-test	Post-test 1	Post-test 2
Anxiety (0-10)	4.59 (2.00)	4.17 (2.28)	4.37 (2.42)	6.43 (1.81)	5.86 (2.44)	4.72 (1.66)
Mental effort (0-150)	56.25 (31.05)	53.50 (29.48)	57.14 (28.64)	64.80 (14.65)	68.83 (16.16)	60.77 (18.36)
Heart rate (bpm)	112.61 (16.93)	115.14 (17.82)	114.50 (15.87)	124.47 (19.69)	123.10 (18.60)	128.63 (14.62)

3 *Average anxiety scores ranged from 3.52 (SD = 2.03) in "passive aggressive" to 6.29 (SD = 2.91) in "handgun attack".*

Performance

For reasons of readability in this section, we only discuss full statistics of overall performance. As for the other performance variables, we discuss the general results. Full statistics are presented in Appendix 6.1. Appendix 6.2 presents the *p*-values from posthoc pairwise comparisons performed when significant interaction effects were found.

On overall performance, there was a main effect for test, $F(2,18) = 100.08$, $p < .001$, $f = 3.32$, but not for group, $F(1,9) = 3.34$, $p = .10$. There was also a significant interaction between group and test, $F(2,18) = 34.82$, $p < .001$, $f = 1.97$ (see Figure 6.2). The FIRST/ASDS group performed significantly better in Post-test 1 and Post-test 2 than in the Pre-test, $p < .001$, 95% CI [1.10, 1.96], $p < .001$, 95% CI [1.02, 2.04] (see Table 6.2 for mean values). There was no significant difference between Post-test 1 and 2, $p > .99$. The ASDS/FIRST group performed significantly better in Post-test 2 than in the Pre-test and in Post-test 1, $p < .001$, 95% CI [1.01, 2.12], $p < .001$, 95% CI [1.22, 1.98]. There was no significant difference between the Pre-test and Post-test 1, $p > .99$. These results indicate that performance of both groups improved after the FIRST training and not after the ASDS training.

Similar significant interactions between group and test were shown in the pre-contact phase for communication, alertness, assertiveness, active posture, and positioning (see Appendix 6.1 and 6.2 for full statistics). The same was true for communication and resolution in the contact phase, confirming the effects found for overall performance. For proportionality, there was no significant interaction effect, but there was a significant main effect for test. It seems that participants performed better in Post-test 2 than in the Pre-test, although the difference just failed to reach significance, $p = .06$. Still, the average scores may imply that the trainings and getting used to performing in threatening circumstances contributed to better performance in Post-test 2. Furthermore, there were significant interactions between group and test for scan area and control before handcuffing. Although the differences were in the expected direction (better performance after the FIRST training), the pairwise comparisons failed to reach significance.

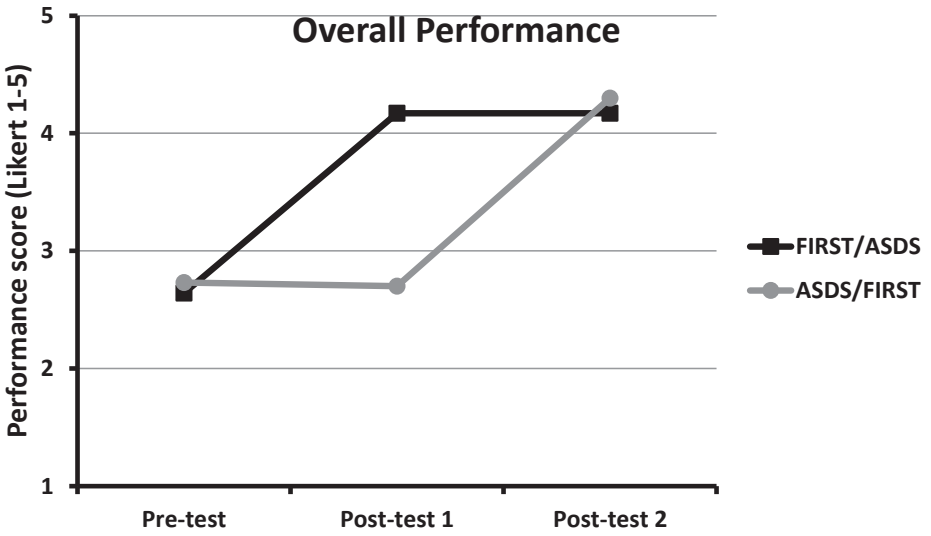

Figure 6.2. Overall performance score per group per test.

Table 6.2. Mean performance scores (and SDs) per group per test.

	FIRST/ASDS			ASDS/FIRST		
	Pre-test	Post-test 1	Post-test 2	Pre-test	Post-test 1	Post-test 2
Overall performance	2.64 (0.19)	4.17 (0.57)	4.17 (0.55)	2.73 (0.35)	2.70 (0.27)	4.30 (0.46)
Pre-contact phase						
Communication	3.14 (0.27)	3.72 (0.57)	4.00 (0.52)	3.40 (0.45)	3.10 (0.22)	3.93 (0.45)
Alertness	2.69 (0.46)	4.00 (0.56)	4.06 (0.65)	3.07 (0.38)	3.03 (0.14)	4.27 (0.45)
Assertiveness	3.03 (0.39)	3.75 (0.48)	4.03 (0.53)	3.07 (0.32)	2.67 (0.26)	4.13 (0.66)
Active posture	2.72 (0.27)	3.78 (0.49)	3.72 (0.34)	2.97 (0.43)	2.83 (0.24)	4.13 (0.46)
Positioning	2.78 (0.29)	3.81 (0.63)	4.14 (0.29)	2.37 (0.25)	2.53 (0.18)	4.13 (0.14)
Contact phase						
Communication	2.61 (0.23)	3.83 (0.41)	3.83 (0.61)	3.14 (0.25)	2.78 (0.27)	3.97 (0.69)
Resolution	3.06 (0.27)	3.81 (0.44)	4.00 (0.41)	2.91 (0.34)	3.18 (0.12)	4.07 (0.30)
Proportionality	4.58 (0.42)	4.83 (0.21)	4.81 (0.16)	4.42 (0.41)	4.55 (0.31)	4.90 (0.09)
Scan area	2.86 (0.34)	3.39 (0.33)	3.42 (0.38)	3.13 (0.20)	2.97 (0.38)	3.40 (0.28)
Control before handcuffing	3.00 (0.63)	3.58 (0.49)	3.58 (0.58)	3.12 (0.63)	2.50 (0.58)	3.75 (0.87)
Technique variables						
Use of flinch response	1.94 (0.26)	3.95 (0.91)	4.00 (0.79)	2.08 (0.29)	2.00 (0.31)	4.40 (0.31)
Extension power	2.25 (0.35)	3.25 (0.87)	3.36 (1.03)	1.85 (0.52)	2.10 (0.15)	3.17 (0.71)
Flexion power	2.25 (0.35)	3.25 (0.87)	3.36 (1.03)	2.48 (0.58)	2.93 (0.40)	1.90 (0.19)
Effectiveness verbal skills	2.89 (0.25)	3.53 (0.40)	3.66 (0.62)	2.98 (0.39)	2.75 (0.28)	3.62 (0.41)
Effectiveness physical skills	2.73 (0.20)	4.22 (0.53)	4.18 (0.52)	2.81 (0.47)	2.58 (0.31)	4.56 (0.31)
Effectiveness response against an armed attack	1.33 (0.41)	4.17 (0.93)	4.33 (0.75)	1.60 (0.55)	1.70 (0.76)	4.10 (1.24)

As for the technique variables, there was a significant interaction between group and test on use of flinch response (see Appendix 6.1 and 6.2 for full statistics). After the FIRST training, participants were better able to convert the flinch response into tactical movements. Although there was also a significant interaction on flexion power, the expected differences between tests (less use of flexion power) mostly did not reach significance. In addition, there was a significant main effect for test on extension power, showing that participants used extension power more in Post-test 2 than in the Pre-test and in Post-test 1, $p < .05$, 95% CI [0.22, 2.20], $p < .05$, 95% CI [0.08, 1.10]. Finally, there were significant interactions on effectiveness of verbal skills, physical skills and response against an armed attack showing that effectiveness improved after the FIRST training.

Discussion

We investigated the effects of reflex-based self-defence training on police performance in high-pressure arrest situations. In a cross-over design, police officers received a training in which they learned to use primary reflexes as effective self-defence skills (FIRST training) and a control training (regular ASDS training). Officers' performance was tested on several variables in six realistic scenarios before, between and after the two trainings. Even though participants were satisfied with both trainings, results showed improved performance after the reflex-based training for both groups (FIRST/ASDS and ASDS/FIRST), while there was no such effect of the regular police training. The FIRST training resulted in improved overall performance, which was also visible in communication, alertness, assertiveness, active posture, positioning, resolution, and converting flinch responses into tactical movements, leading to more success in using verbal and physical skills. The crossover design allowed us to show on two occasions that performance was improved after the FIRST training, once from Pre-test to Post-test 1 for the FIRST/ASDS group, and once from Post-test 1 to Post-test 2 for the ASDS/FIRST group. Moreover, it was shown that the effect of the FIRST training was at least maintained from Post-test 1 to Post-test 2 for the FIRST/ASDS group. In short, it seems that FIRST training, even one session, can already improve arrest and self-defence skills of officers in threatening arrest situations.

The FIRST training involved situations in which officers arrive at a certain location, start a conversation with a certain person while that person refuses to cooperate and sometimes even becomes aggressive and attacks the officer. Recognition of signals of a possible attack was a first topic in the training. When officers perceive such signals, they may anticipate the attack (e.g., an officer gives a suspect a speeding ticket and that person starts to behave aggressively), and consequently a possible flinch-response. Renden et al. (2014) have recently shown that once an attack takes place, it is hard to inhibit avoidance behaviour (including the flinch response). However, as shown here, the flinch response may provide a proper basis for subsequent arrest and self-defence actions. The

flinch response is initiated by increased amygdala-activation (Blanchard and Blanchard, 1969; Fendt and Fanselow, 1999), making it a naturally occurring, highly reliable and effective mechanism (Cobb and Pincus, 2003). Furthermore, in the time before an attack, officers can pick up signals that may announce an upcoming attack so that they can take the necessary precautions to counter the attack effectively. Rather than moving away, for instance, the officer can approach the suspect in order to decrease his or her movement space for executing a punch or other attack. In addition, the officer should keep the hands between them in order to use a potential flinch response as a block. With this approach officers also show that they are not intimidated by the suspect's behaviour and that they are in charge of the situation. With the correct communication, this approach may work deescalating and an attack may be prevented.

In case an attack cannot be prevented, the officer is prepared for the attack and for the officer's own automatic responses. As a follow-up on the flinch response, the officer should continue on the already initiated movements by pushing the suspect towards, for instance, the car or the floor. Such gross motor responses are much easier to execute than the current ASDS (finer motor sequences) as these are based on primary reflexes and because the movements are controlled at lower levels of the central nervous system making them more robust to the influence of anxiety (see Bernstein, 1996). Even in situations with no attack and thus no flinch response, such skills (making use of extensor power) are still very effective (e.g., in situations with passive aggression or a pushing suspect). Thus, with the correct anticipation on possible attacks, officers can use skills, compatible with primary reflexes, to gain control of the situation. The results of this study show that such an approach may not only be more effective than using regular ASDS, but it also seems that it can be learned in a short period of time.

Next to their physical skills, officers also improved the accompanying skills such as communication and assertiveness after the FIRST training. Our speculation is that officers now had a specific plan in how they approached the scenarios and what they wanted from the suspect (even though they did not know what would happen). As such, their behaviour became more goal-directed. Instead of giving many warnings (and not following up), they told the suspect what he had to do and what he could not do. In case the suspect did not listen, the officers knew what they had to do in their approach and in their response after a possible attack. After the last test session, participants also reported that the FIRST training made them more secure; they knew what to do, regardless of how the situation would develop. Interestingly, the regular ASDS training was not accompanied by any of these benefits.

As this study focussed on applied implications of a training concept, we can merely speculate about theoretical explanations for why the FIRST training had such positive effects. As discussed in the introduction, the content of reflex-based self-defence training is more compatible with and even makes use of primary reflexes such as the flinch response (Cobb and Pincus, 2003). Consequently the taught movement skills

are controlled at lower levels of the central nervous system (Bernstein, 1996) making these skills more robust to the negative effects of anxiety. As these skills require less prefrontal control they are less affected by increased amygdala activation (Bishop et al., 2004; Bishop, Duncan, and Lawrence, 2004), as a result of which performance can be maintained, even under high levels of anxiety (Eysenck et al., 2007; Nieuwenhuys and Oudejans, 2012). Future research is needed to investigate and confirm these theoretical interpretations.

It is important to note that this study was performed with a small sample size. That we found such positive effects of the FIRST training despite the small sample size is promising. Yet, it is clear that this study needs a follow up with a larger sample size perhaps with officers with different levels of experience with violence (in work, training, or leisure time; Renden et al., 2015). Furthermore, a follow up study needs to determine the long-term effect of the FIRST training as well as the effects of multiple training sessions.[4] Still, the current results are promising as officers' behaviour already improved after only one training session. This means that it is feasible to implement this form of training in the current training policy, especially if this method is already implemented at the police academy (training police recruits) where there is more time to train. If properly learned at the police academy, it may well be that a few training moments per year are sufficient to maintain skill level for regular officers. As a final remark, it is important to train these skills in threatening circumstances (i.e., in scenarios comparable with those used in this study) to evoke flinch responses and to let officers experience what anxiety does with their behaviour and action possibilities (Oudejans, 2008; Nieuwenhuys and Oudejans, 2012; Nieuwenhuys et al., 2009, Renden et al., 2014).

To summarize, we found that officers' performance improved after a reflex-based self-defence training while performance remained similar after a regular ASDS training. Improved performance was accompanied by better communication, alertness, assertiveness, resolution, and converting flinch responses into tactical movements. By anticipating on a possible attack and using skills that are compatible with primary reflexes, officers were better able to perform effectively despite the high levels of anxiety. Therefore, our results seem to suggest that reflex-based self-defence training better prepares officers for performing in high-pressure arrest situations than the regular ASDS training.

4 *Participants in this study were trained in basic components of the FIRST program. The training in this study did not concern the total concept.*

Appendix 6.1. Results of the 2 (Group: FIRST/ASDS, ASDS/FIRST)) × 3 (Test: Pre-test, Post-test 1, Post-test 2) ANOVAs on performance. Significant results are shown in bold.

	Group	Test	Group × Test
Pre-contact phase			
Communication	$F(1,9) = 0.48, p = .51$	**$F(2,18) = 20.40, p < .001, f = 1.51$**	**$F(2,18) = 7.45, p < .01, f = 0.91$**
Alertness	$F(1,9) = 0.29, p = .60$	**$F(2,18) = 37.19, p < .001, f = 2.03$**	**$F(2,18) = 12.12, p < .001, f = 1.16$**
Assertiveness	$F(1,9) = 2.71, p = .13$	**$F(2,18) = 19.63, p < .001, f = 1.48$**	**$F(2,18) = 7.09, p < .01, f = 0.84$**
Active Posture	$F(1,9) = 0.34, p = .57$	**$F(2,18) = 29.25, p < .001, f = 1.80$**	**$F(2,18) = 13.52, p < .001, f = 1.22$**
Positioning	**$F(1,9) = 15.36, p < .01, f = 1.30$**	**$F(2,18) = 70.23, p < .001, f = 2.79$**	**$F(2,18) = 11.80, p < .01, f = 1.14$**
Contact phase			
Communication	$F(1,9) = 0.39, p = .55$	**$F(2,18) = 22.52, p < .001, f = 1.58$**	**$F(2,18) = 14.37, p < .001, f = 1.26$**
Resolution	$F(1,9) = 3.13, p = .11$	**$F(2,18) = 30.22, p < .001, f = 1.83$**	**$F(2,18) = 3.43, p = .05, f = 0.62$**
Proportionality	$F(1,9) = 0.78, p = .40$	**$F(2,18) = 6.12, p < .01, f = 0.83$**	$F(2,18) = 1.88, p = .182$
Scan area	$F(1,9) = 0.17, p = .69$	**$F(2,18) = 6.29, p < .01, f = 0.84$**	**$F(2,18) = 4.35, p < .05, f = 0.70$**
Control before handcuffing	$F(1,9) = 0.63, p = .45$	**$F(2,18) = 6.42, p < .01, f = 0.90$**	**$F(2,18) = 6,42, p < .01, f = 0.90$**
Technique variables			
Use of flinch response	$F(1,9) = 3.08, p = .11$	**$F(2,18) = 69.46, p < .001, f = 2.77$**	**$F(2,18) = 23.93, p < .001, f = 1.63$**
Extension power	$F(1,9) = 4.18, p = .07$	**$F(2,18) = 10.38, p < .01, f = 1.07$**	$F(2,18) = 1.79, p = .195$
Flexion power	$F(1,9) = 0.69, p = .43$	$F(2,18) = 1.41, p = .269$	**$F(2,18) = 5.55, p < .05, f = 0.78$**
Effectiveness verbal skills	$F(1,9) = 1.50, p = .25$	**$F(2,18) = 14.21, p < .001, f = 1.26$**	**$F(2,18) = 6.02, p < .05, f = 0.82$**
Effectiveness physical skills	$F(1,9) = 4.83, p = .06$	**$F(2,18) = 55.83, p < .001, f = 2.49$**	**$F(2,18) = 25.34, p < .001, f = 1.68$**
Effectiveness response against an armed attack	**$F(1,9) = 5.48, p < .05, f = 0.78$**	**$F(2,18) = 41.99, p < .001, f = 2.23$**	**$F(2,18) = 11.74, p < .01, f = 1.14$**

Appendix 6.2. *p*-Values from the posthoc pairwise comparisons in case of a significant interaction between group and test. Significant *p*-values are shown in bold.

Pre-contact phase							
Group	Test	Compared with	Communication	Alertness	Assertiveness	Active posture	Positioning
FIRST/ASDS	Pre-test	Post-test 1	***p* < .05**	***p* < .01**	***p* = .05**	***p* < .01**	***p* < .01**
		Post-test 2	***p* < .01**	***p* < .01**	***p* < .05**	***p* < .01**	***p* < .001**
	Post-test 1	Post-test 2	*p* = .06	*p* = 1.00	*p* = .30	*p* = 1.00	*p* = .09
ASDS/FIRST	Pre-test	Post-test 1	*p* = .38	*p* = 1.00	*p* = .52	*p* = 1.00	*p* = 1.00
		Post-test 2	*p* = .09	***p* < .01**	***p* < .05**	***p* < .01**	***p* < .001**
	Post-test 1	Post-test 2	***p* < .001**	***p* < .001**	***p* < .001**	***p* < .001**	***p* < .001**

Contact phase						
Group	Test	Compared with	Communication	Resolution	Scan area	Control before handcuffing
FIRST/ASDS	Pre-test	Post-test 1	***p* < .001**	***p* < .05**	***p* < .05**	*p* = .09
		Post-test 2	***p* < .01**	***p* < .01**	***p* = .05**	*p* = .09
	Post-test 1	Post-test 2	*p* = 1.00	*p* = .20	*p* = 1.00	*p* = 1.00
ASDS/FIRST	Pre-test	Post-test 1	*p* = .22	*p* = .84	*p* = .88	*p* = .16
		Post-test 2	***p* < .05**	***p* < .01**	*p* = .66	*p* = .16
	Post-test 1	Post-test 2	***p* < .01**	***p* < .001**	*p* = .07	***p* < .05**

Technique variables							
Group	Test	Compared with	Use of flinch response	Flexion power	Effectiveness verbal skills	Effectiveness physical skills	Effectiveness response against armed attack
FIRST/ASDS	Pre-test	Post-test 1	***p* < .001**	*p* = .13	***p* < .01**	***p* < .001**	***p* < .001**
		Post-test 2	***p* < .001**	*p* = 1.00	***p* < .05**	***p* < .001**	***p* < .001**
	Post-test 1	Post-test 2	*p* = 1.00	*p* = .15	*p* = 1.00	*p* = 1.00	*p* = 1.00
ASDS/FIRST	Pre-test	Post-test 1	*p* = 1.00	*p* = .96	*p* = .59	*p* = 1.00	*p* = 1.00
		Post-test 2	***p* < .001**	*p* = .63	*p* = .09	***p* < .001**	***p* < .01**
	Post-test 1	Post-test 2	***p* < .001**	***p* < .05**	***p* < .01**	***p* < .001**	***p* < .01**

CHAPTER 7

Epilogue

This thesis concentrated on the influence of anxiety on police officers' performance of arrest and self-defence skills (ASDS). Officers can experience anxiety during situations with physical violence (Anderson et al., 2002), which makes it difficult to perform well (cf., Nieuwenhuys & Oudejans, 2012). On top of that, regular ASDS training seems to lack sufficient frequency and reality-based content to optimally prepare officers to manage violence on duty. Yet, officers are expected to perform effectively in threatening circumstances, and by doing so, to act reasonably and proportionally. Therefore, the thesis' first question is whether officers are capable to show effective ASDS performance under pressure. The second question is whether (and if so, how) ASDS training can be improved to prepare officers better for violent situations. Answers to these questions are presented in the following summary. Then, theoretical and practical implications are provided.

Summary

Given the limited number of training hours as well as the difficulty of performing under pressure, it is worth investigating how experience (in performing ASDS) and anxiety are related to the perceived ability to perform effectively on duty. As no institution in The Netherlands has a systematic and conclusive overview of the use of legal force on duty (Timmer, 2005), in Chapter 2 the aim was to perform a questionnaire study on a large scale to provide data based on officers' experiences from their work. By using an online questionnaire, officers gave insight into how they perceive their ASDS preparation and their ability to manage violence on duty. Furthermore, it was assessed whether additional experience (i.e., by having encountered violence on duty or by practicing martial arts) and self-perceived anxiety have an influence on these perceptions. Results showed that having additional experience was associated with better perceived performance. On the other hand, officers who experienced more anxiety more often reported also more problems. Although most officers reported sufficiently effective performance, they, especially those with additional experience, felt that training frequency is too low and they reported that the currently taught ASDS are only moderately useful (at least with the current amount of training).

The questionnaire's results motivated further investigation of the effects of anxiety on the execution of officers' ASDS performance. Chapter 3 examined officers who kicked, blocked, or restrained an opponent who attacked them with a rubber knife (low anxiety, LA) or a shock knife (high anxiety, HA). Performance was assessed (on a 5-point Likert scale) as well as movement times, posture, and movement velocity and acceleration. Results revealed that performance was worse in the HA compared to the LA condition. Furthermore, kinematic data showed that under increased anxiety, officers' performance contained characteristics of avoidance behaviour, such as faster reactions (to reduce the time being exposed to the threat), leaning further backward (kick), and ducking down (block).

Chapter 4 expanded ASDS performance from just focussing on single skill execution to also take into account accompanying skills such as communication, interpreting a situation, and choosing the correct approach. The experiment consisted of two experimental situations with two different levels of threat, in which officers had to choose and initiate their actions themselves while they had to control and arrest a non-cooperative suspect. It was examined whether threat and trait anxiety influenced state anxiety and how that influenced decision making (e.g., choosing the appropriate actions; timing of initiation of actions) and performance (e.g., quality of communication; execution of skills). Results showed that trait anxiety affected the level of state anxiety, but not any of the decision making and performance variables. As for decision making, only threat determined which skills officers used to gain control over the suspect. Still, in less-threatening scenarios, more state anxiety was related with longer hesitations before officers initiated their actions to gain control. As for performance, higher levels of state anxiety were accompanied by lower scores on overall performance, communication, proportionality of applied force, and quality of skill execution.

Thus, Chapter 2, 3, and 4 consistently showed that anxiety negatively affects ASDS performance. Increasing the current training frequency may be an efficient tool to improve ASDS performance in threatening circumstances (see also Chapter 2). To investigate this assumption, Chapter 5 examined whether officers with additional martial arts training experience performed better in ASDS scenarios under low and high anxiety and were better able to maintain performance under high anxiety than officers who just rely on regular police training. We were especially interested to find out whether training once a week would already lead to better performance under high anxiety. Officers with additional experience in kickboxing or karate/jiu-jitsu (training several times per week), krav maga (training once a week) and officers with no additional experience performed several ASDS. Results showed that officers with additional experience (also those who trained once a week) performed better under high anxiety than officers with no additional experience. Still, the additional experience did not prevent these participants from performing worse under high anxiety compared to low anxiety.

Another possibility to increase ASDS performance in threatening circumstances is to better adjust the content of training to police work on duty (see also Chapter 2). For example, basic reflex-like skills may be learned in less time and easier to apply than the from sports originating ASDS. Therefore, Chapter 6 investigated the effects of reflex-based self-defence training on police performance in arrest situations. Officers received such a training as well as a regular police arrest and self-defence skills training (control training) in a cross-over design. Officers' performance was tested on several variables in six realistic scenarios before, between and after the two trainings. Results showed improved performance after the reflex-based training, while there was no such effect of the regular police training. Improved performance was caused by better communication, alertness, assertiveness, resolution, and converting flinch responses into tactical movements. As

officers were taught to anticipate on possible attacks and to respond with skills based on their primary reflexes, they were better able to perform effectively.

Conclusions

Overall, the reported studies show that anxiety negatively affects ASDS performance (Chapter 2-5), which includes skill execution (Chapter 3), but also accompanying skills such as communication (Chapter 4). In line with recent theoretical developments (Nieuwenhuys & Oudejans, 2012), it appears that under increased anxiety, police officers were less able to inhibit stimulus-driven processing (e.g., fear of getting hit) and enforce goal-directed processing (e.g., kick the opponent back as far as possible) leading to avoidance behaviour. Avoidance behaviour became visible in, among others, leaning backwards during kicking, ducking down during blocking (Chapter 3), or longer hesitations during an arrest (Chapter 4).

Remarkably, performance seemed similarly affected among officers with different levels of experience (Chapter 5). Although more training experience led to better performance, also in threatening situations, it could not prevent that performance was affected by anxiety. Therefore, next to training more frequently, it seems that officers also need to train more under high levels of anxiety to become better able in maintaining goal-driven attention (and thus performance) in threatening situations (cf. Nieuwenhuys & Oudejans, 2011). In line with more realistic training, officers may also benefit from reflex-based self-defence training (Chapter 6). After such training, officers performed better in different situations. These results seem to suggest that reflex-based self-defence training better prepares officers for performing on duty than the current form of ASDS training.

Theoretical implications

In line with many studies concerning anxiety and perceptual-motor performance (e.g., Behan & Wilson, 2008; Causer, Holmes, Smith, & Williams, 2011; Nieuwenhuys, & Oudejans, 2010; Nieuwenhuys, Pijpers, Oudejans, & Bakker, 2008; Wilson, Wood, & Vine, 2009), and more specifically, anxiety and handgun shooting (e.g., Nieuwenhuys & Oudejans, 2010, 2011), this thesis consistently shows that anxiety also negatively affects police officers' ASDS performance (Chapter 2-5). Even additional training experience could not prevent that officers performed worse under the influence of anxiety (Chapter 5).

Attention, interpretation and response tendencies

As explained in the thesis' introduction, in introducing their model concerning anxiety and perceptual-motor performance, Nieuwenhuys and Oudejans (2012) argue that anxiety affects people's attention, interpretation, and response tendencies. As for attention, it has been shown that under the influence of anxiety, attention shifts from goal-direct-

ed (task-relevant) stimuli towards threat-related stimuli (task-irrelevant), which makes it harder to pay attention to task-relevant stimuli (e.g., Nieuwenhuys & Oudejans, 2010, Nieuwenhuys, Savelsbergh, & Oudejans, 2012; Wilson, Vine, & Wood, 2009; Wilson, Wood, & Vine, 2009). As a result, behaviour changes under the influence of anxiety.

As for interpretation, Nieuwenhuys, Savelsbergh, and Oudejans (2012) and Nieuwenhuys, Cañal-Bruland, and Oudejans (2012) found that anxiety affected officer's decision making regarding whether or not to shoot a suspect and when to shoot an approaching suspect who is holding a knife. In both studies, the authors suggested that officers made their decision on the basis of their interpretation of threat indicating that when officers where more anxious, they interpreted the threat as higher than when they were less anxious (see also Bishop, Duncan, Brett, & Lawrence, 2004; Bishop, Duncan, & Lawrence, 2004). However, it was shown in Chapter 4 that anxiety had no effect on which skill officers used to gain control of the suspect. These seemingly contrasting findings can probably be explained by the differences in who had to initiate the first action in the experimental setting. In the earlier studies, officers reacted against the actions of a suspect. In Chapter 4, officers had sufficient time to analyse the situation and respond with the correct action. Still, in Chapter 4 it was also shown that more anxiety was related with longer hesitations before officers acted. Whether this was due to a different interpretation of threat or to an incongruent emotional state with goal-directed behaviour (physically approaching and controlling the suspect) (cf. Stins et al., 2011) could not be determined. Therefore, future research is needed to further investigate the relation between anxiety and decision making.

In any case, officers' initial response tendency seemed to be to stay at a distance and try to verbally convince the suspect to cooperate (even though he had repeatedly made clear that he would not cooperate) rather than to physically approach and control the suspect. Such behaviour is an example of avoidance behaviour which was also shown in Chapter 3 when officers had to counter a knife attack. In this case they reacted sooner to the attack, leaned further backward when executing kicks, and ducked down and blocked lower when executing blocks. The findings in Chapters 3 and 4 indicate that with increased anxiety officers were less able to inhibit stimulus-driven processing and enforce goal-driven processing leading to avoidance behaviour and a decrease in performance. How avoidance behaviour manifested itself in response tendencies seems to depend on the task and situation. Therefore, expectations of the influence of anxiety cannot be simply generalized to all situations.

Possible solutions to reduce the effect of anxiety

The results of Chapter 5 and 6 showed some possible solutions to reduce the negative effects of anxiety on performance. First, more training seems beneficial to perform better under anxiety (Chapter 5). Previous research has shown that people need thousands of hours of deliberate practice (Ericsson, 2014) and hundreds of thousands of repetitions

(e.g., Crossman, 1959; Kottke, 1980) to become expert in perceptual-motor skills. Such investment in training is needed to reach automation, standardisation and stabilisation of skill execution leading to more resistance against the influence of anxiety (Bernstein, 1996). However, literature shows that even elite athletes sometimes perform worse under increased levels of anxiety (e.g., Jordet & Hartman, 2008), which indicated that just training sufficient hours is not sufficient (cf. Duke, Simmons, & Cash, 2009). In fact, it was shown in Chapter 5 that although officers with more training experience performed better under anxiety, their performance was similarly affected by anxiety compared to a low-anxiety condition as performance of officers with less training experience.

As a possible solution, the model by Nieuwenhuys and Oudejans (2012) proposes that training needs to focus on enforcing goal-directed attention (cf. Nieuwenhuys & Oudejans, 2011; Wilson et al., 2011). Specifically for ASDS training, officers in Chapter 6 were learned to focus on signals of imminent danger and how to anticipate on a potential attack. This training indeed resulted in better performance in a series of reality-based scenarios, which indicates that officers' goal-directed attention may have been enforced as a result of the training. In addition, officers also learned to use movements that are compatible with primary reflexes and controlled at lower levels of the central nervous system (cf. Bernstein, 1996). Such movements are assumed to be more robust for the influence of anxiety as less cognitive control (which is less available under anxiety, cf. Bishop Duncan, Brett, & Lawrence, 2004; Bishop, Duncan, & Lawrence, 2004) is necessary.

As a result of more and better training, people's confidence that they possess the necessary resources to successfully perform a task may also be enhanced. The biophysical model of challenge and threat describes that individuals evaluate whether they have the necessary resources to successfully perform a task (Blascovich, 2008). If they believe they do, a challenge state occurs, if not, a threat state occurs. In Chapter 4, it was suggested that the officers who were more anxious experienced a threat state and the ones who were less anxious a challenge state. Literature indeed has shown that a threat state is associated with higher levels of state anxiety (e.g., Quested et al., 2011; Williams, Cumming, Balanos, 2010), less effective attention (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004; Moore, Vine, Wilson, & Freeman, 2012), and worse performance (e.g., Gildea, Schneider, & Shebilske, 2007). Future research is needed to investigate whether challenge and threat states explain variability in state anxiety among officers, how their states relate to performance, and whether more and/or better training is associated with changes in challenge and threat states.

Practical implications

The thesis' results have a number of important implications for ASDS training. The results from Chapters 2-5 consistently showed that anxiety had a negative effect on performance. Worse performance on duty may have serious consequences for the officers themselves,

but also for their colleagues, others involved (such as suspects), and bystanders. Therefore, it seems necessary to improve ASDS preparation in order to improve performance on duty. On the basis of the thesis' results, two suggestions can be made to improve ASDS training: more training and more realistic training.

The results from Chapter 2 and 5 show that officers' ASDS performance improve considerably when they train more often. That is not surprising given the four to six hours that officers currently have available per year for ASDS training. Several studies have shown that the level of performance and the number of training hours are strongly related (e.g., Ericsson, 2004; Ericsson et al., 1993; Simonton, 2000; Ward et al., 2007). That was also true for officers who participated in Chapter 5; officers who trained martial arts once a week (or more) performed better under anxiety than officers who just rely on the regular ASDS training.

Still, even though more training led to better performance, it could not prevent that anxiety negatively affected officers' performance (Chapter 5). The negative influence of anxiety seems a persistent factor in ASDS performance under pressure (Chapter 2-5). However, several studies have shown that how people train is also of high importance in skill acquisition (Duke, Simmons, & Cash, 2009; Van Rossum, 2000; Ward at al., 2007). Previous research has shown that performance under anxiety increased after reality-based training (e.g., Nieuwenhuys & Oudejans, 2011; Oudejans, 2008; Oudejans & Pijpers, 2009, 2010). Such training seems to enforce goal-directed attention under high levels of anxiety. This is important knowledge for practitioners of dangerous professions (e.g., police officers, firefighters, soldiers), but also for, for instance, surgeons who's performance sometimes literally determines whether someone lives or dies. Also athletes may benefit from reality-based training as their success or failure is often determined at key moments with tremendous levels of pressure.

Specified for ASDS, officers seem to benefit from more reflex-based self-defence training (Chapter 2 and 6). After the reflex-based self-defence training in Chapter 6, officers were better able to notice signals of imminent danger, to anticipate on a potential attack, and in case an attack occurred, to better use their primary reflexes as effective responses. As such, the thesis' outcomes has important practical implications. As one training already improved officers' performance in several situations (and a regular ASDS training had no effect), it seems of high relevance for the Dutch Police to implement such a training concept in their initial training at the Police Academy and in their training for regular police officers at the several police training centres.

To summarize, this thesis shows that the current form of ASDS training is not sufficient to counteract the negative influence of anxiety on ASDS performance. By increasing the current training frequency and making the content more reality-based (with real threats, better anticipation on possible attacks and converting stress responses into tactical movements), officers' performance is expected to increase in situations with physical violence. Better performance is expected to lead to more safety for officers, suspects and citizens in general.

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SUMMARY

(samenvatting)

Politieprestaties onder druk: Aanhouding en zelfverdediging

Het doel van het hier gerapporteerde onderzoek was om de invloed van angst op de kwaliteit van aanhoudings- en zelfverdedigingsvaardigheden (AZV) van politieambtenaren te onderzoeken. Op jaarbasis is vaak minder dan zes uur beschikbaar voor het trainen en onderhouden van AZV. Daarnaast verschillen de omstandigheden tijdens training en toetsing dusdanig van de praktijk, dat verondersteld kan worden dat de AZV-voorbereiding van politieambtenaren niet optimaal is. Toch wordt van politieambtenaren verwacht dat zij onder hoge druk effectief en voor het beoogde doel redelijk en gematigd kunnen handelen. De hoofdvraag in dit onderzoek was dan ook in hoeverre politieambtenaren, op basis van de genoten training en ervaring, in staat zijn om onder hoge druk effectief gebruik te blijven maken van AZV. Een tweede vraag was of (en zo ja, hoe) AZV-training verbeterd kan worden om politieambtenaren in de toekomst beter voor te bereiden op geweldsituaties. Op basis van de beschreven studies is op deze vragen antwoord gegeven.

Samenvatting

In Hoofdstuk 2 werd onderzocht hoe politieambtenaren hun eigen voorbereiding op en prestaties in geweldsituaties ervaren. Met een online vragenlijst reageerden politieambtenaren op stellingen over de aangeleerde vaardigheden, de AZV-trainingen, het gebruik van AZV in de praktijk en de effectiviteit van hun handelen in geweldsituaties. De focus van deze studie lag vooral op verschillen tussen politieambtenaren die meer ervaring hebben in het uitvoeren van zelfverdedigingstechnieken (bijv. opgedaan in de praktijk of door vechtsporttraining in hun vrije tijd) en politieambtenaren die alleen kunnen terugvallen op de reguliere politietraining. Ook lag de focus van deze studie op verschillen tussen politieambtenaren die meer of minder angst hebben ervaren tijdens geweldsituaties. De resultaten impliceren dat meer ervaring samengaat met betere AZV-prestaties in de praktijk. Meer angst in geweldsituaties leidt juist vaak tot meer problemen. Hoewel de meeste respondenten rapporteerden dat ze voldoende effectief kunnen handelen in geweldsituaties, vinden ze dat ze te weinig AZV-training krijgen en dat de huidige AZV maar beperkt te gebruiken zijn in geweldsituaties. AZV-training lijkt dus aan herziening toe, met als doel politieprestaties in geweldsituaties verder te verbeteren en het aantal onveilige situaties (met risico op gewonde politieambtenaren, verdachten en omstanders) terug te brengen.

De resultaten uit de vragenlijststudie gaven aanleiding om de invloed van angst op AZV-prestaties verder te onderzoeken. In Hoofdstuk 3 werden de effecten van angst op de motorische uitvoering van AZV experimenteel onderzocht. Politieambtenaren moesten met een drietal vaardigheden (voorwaartse trap, blokkering, bokkenpoot) reageren in een situatie waarin zij met een rubber mes (lage druk) of met een elektrisch geladen mes (hoge druk) bedreigd werden. De prestaties werden beoordeeld door gebruik te maken van een 5-puntsbeoordelingsschaal en door verschillende houdings-

en bewegingsvariabelen te meten. Uit de resultaten bleek dat de politieambtenaren de trap en de blokkering slechter uitvoerden onder hoge druk dan onder lage druk. De houdings- en bewegingsvariabelen lieten zien dat prestatieverschillen werden veroorzaakt doordat de politieambtenaren onder hoge druk sneller (gehaaster) reageerden op de mesaanval en meer naar achter leunden (trap) of zich kleiner maakten en lager blokkeerden (blokkering). Het onvoldoende de tijd nemen voor de uitvoering van een vaardigheid en een onjuiste houding daarbij aannemen lijken veroorzaakt te zijn doordat de politieambtenaren hun aandacht richtten op het niet geraakt worden door het mes, terwijl de aandacht richten op een goede uitvoering van een trap of blokkering waarschijnlijk tot een betere prestatie zou leiden.

In Hoofdstuk 4 werd de beoordeling van AZV-prestaties verder uitgebreid door niet alleen te focussen op de motorische handeling, maar ook op relevante vaardigheden, zoals communicatie naar de verdachte, interpretatie van een situatie en selectie van een juiste aanpak. De politieambtenaren kregen de opdracht een verdachte aan te houden die werd verdacht van mishandeling. De verdachte wilde in geen van de gevallen mee met de politieambtenaar en gedroeg zich meer of minder agressief. Er werd onderzocht of en hoe de mate van agressie en de aanleg voor het ervaren van angst van invloed waren op de angst die de politieambtenaren ervoeren tijdens de aanhouding en welk effect dit had op hun keuzegedrag en hun prestaties. Uit de resultaten bleek dat alleen de aanleg voor het ervaren van angst van invloed was op de angst van de politieambtenaren tijdens de aanhouding, maar dat de aanleg verder geen invloed had op hun keuzegedrag of prestaties. Wat betreft hun keuzegedrag bleek alleen de mate van agressie van invloed op welke vaardigheid de politieambtenaren gebruikten om controle te krijgen over de verdachte. De belangrijkste bevinding was dat meer angst leidde tot slechtere prestaties in communicatie, proportionaliteit en kwaliteit van handelen. Daarnaast bleek dat meer angst tijdens de aanhouding gerelateerd was aan langer aarzelen voordat de politieambtenaren tot actie over gingen.

Daarmee laten Hoofdstuk 2, 3, en 4 consistent zien dat angst een negatieve invloed heeft op de AZV-prestaties van politieambtenaren. Zoals verondersteld in Hoofdstuk 2, zou het verhogen van het aantal trainingsuren een oplossing kunnen zijn om de negatieve invloed van angst te reduceren. In Hoofdstuk 5 werd onderzocht of politieambtenaren met vechtsportervaring (opgedaan in hun vrije tijd) beter presteerden onder lage en hoge druk dan politieambtenaren die alleen kunnen terugvallen op reguliere politie training. Ook werd onderzocht of politieambtenaren met vechtsportervaring (in vergelijking met politieambtenaren zonder vechtsportervaring) onder hoge druk net zo goed zouden presteren als onder lage druk. De focus lag vooral op de vraag of het verhogen van de trainingsfrequentie naar eens per week (al) voldoende zou zijn om prestaties onder druk te verbeteren. Politieambtenaren met ervaring in kickboksen of karate/jiujitsu (training meerdere malen per week), krav maga (training eens per week) en politieambtenaren zonder vechtsportervaring oefenden verschillende AZV uit. Uit de resultaten bleek dat

de politieambtenaren met vechtsportervaring (ook degenen die eens per week trainden) beter presteerden onder hoge druk dan de politieambtenaren zonder vechtsportervaring. Toch lieten de politieambtenaren met en zonder vechtsportervaring een vergelijkbaar verval zien in prestaties onder hoge druk ten opzichte van lage druk.

Daarmee lijkt het extra belangrijk ook de inhoud van de trainingen aan te passen, zodat de trainingen beter aansluiten op het werk in de praktijk. In Hoofdstuk 6 werd het effect van een trainingsinterventie gestoeld op instinctieve reacties, op prestaties in geweldsituaties onderzocht. Politieambtenaren ontvingen twee soorten trainingen, namelijk een FIRST-training waarin ze vaardigheden leerden die meer gebaseerd zijn op instinctieve reacties en een reguliere AZV-training (controle-training). De politieambtenaren werden in twee groepen verdeeld: de eerste groep ontving eerst de FIRST-training en later de AZV-training. Bij de tweede groep was de volgorde omgekeerd. Voor, tussen en na de trainingen werden de politieambtenaren getest in zes realistische scenario's (met verhoogde angst) om te bepalen of de gevolgde training van invloed was op hun prestaties. Uit de resultaten bleek dat na een reguliere AZV-training de politieambtenaren niet meer of minder effectief gingen presteren. Na de FIRST-training presteerden de politieambtenaren wel effectiever. Dit kwam onder andere door een betere communicatie, alertheid, assertiviteit, doortastendheid en het inzetten van primaire reflexen als tactische zelfbewegingsmechanismen.

Conclusies

De gerapporteerde studies laten consistent zien dat angst een negatieve invloed heeft op AZV-prestaties van politieambtenaren. Deze prestaties betreffen niet alleen de motorische uitvoering van een vaardigheid, maar ook andere relevante vaardigheden, zoals communicatievaardigheden. Recente theoretische ontwikkelingen suggereren dat wanneer politieambtenaren meer angst ervaren, hun taakgerichte aandacht (bijvoorbeeld nodig om de opponent zover mogelijk naar achteren trappen) verschuift naar stimulusgedreven aandacht (bijvoorbeeld bang zijn om geraakt te worden). Deze aandachtsverschuiving resulteert vaak in vermijdingsgedrag, zoals de romp naar achteren houden tijdens trappen, het lichaam kleiner maken tijdens het blokkeren (Hoofdstuk 3) of langer aarzelen tijdens een aanhouding (Hoofdstuk 4).

Opvallend genoeg bleken prestaties van politieambtenaren met en zonder vechtsportervaring vergelijkbaar te verslechteren door angst (Hoofdstuk 5). Meer trainingservaring leidde wel tot betere prestaties onder hoge druk, maar dat kon niet voorkomen dat prestaties slechter waren dan onder lage druk. Daarom is het niet alleen belangrijk dat politieambtenaren meer training krijgen, maar ook dat deze trainingen realistischer worden en de praktijk beter benaderen. Realistische training voor AZV laat zien dat, wanneer politieambtenaren gericht trainen op signaalherkenning van agressie, anticiperen op mogelijke agressie en gebruik maken van vaardigheden gebaseerd op primaire reflexen, zij beter gaan presteren in (stressvolle) geweldsituaties. Zeker gezien het

geringe aantal trainingsmogelijkheden, is het belangrijk om de trainingen zo realistisch mogelijk neer te zetten, zodat politieambtenaren waardevolle ervaringen opdoen die ze direct kunnen toepassen in de praktijk.

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