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Threat Perception Alteration as an Effect of Use-of-Force Simulation Training

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THREAT PERCEPTION ALTERATION AS AN EFFECT OF USE-OF-FORCE SIMULATION TRAINING

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Threat Perception Alteration as an Effect of Use-of-Force Simulation Training

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ABSTRACT

THREAT PERCEPTION ALTERATION AS AN EFFECT OF USE-OF-FORCE SIMULATION TRAINING

By

Ellyse R. VanDyke

Due to the nature of police work police officers are often placed in life threatening situations. To prepare officers for these interactions police academies employ use-of-force simulations to train relevant skills such as situational awareness and judgement. Repeated exposure to threatening situations, such as those in the use-of-force simulations, may alter the threat perception of the participant. Using self-report measures of anxiety (STAI-6 Item) and affect (PANAS), as well as respiration rate data, and short answer self-reports, the present study aims to determine if perception of threat is altered as a result of the use-of-force training, both directly after one training session and after completing the 16 week training. Two alternative hypotheses predict the outcome: a) the training will increase the participant's situational awareness, in turn increasing threat perception with an increase in anxious symptoms and autonomic arousal as evidence, or b) the training will desensitize the participant to violence leading to decreased threat perception with decreased positive and negative affect, and decreased autonomic arousal as evidence. Evidence for the latter hypothesis was found indicating that repeated exposure to the use-of-force training simulation increased participant's perception of threat, manifested by an overall decrease in emotional responding suggesting that the participants were desensitized to threat over time. It is possible that decreased emotional responding due to desensitization can lead to maladaptive processes such as affective blunting, therefore it is important to examine this link between officer training and desensitization to threat.

Keywords: use-of-force, threat perception, hypervigilance, affective blunting

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Introduction

According to the National Law Enforcement Officer Memorial Fund (2018) firearms-related fatalities have risen more than 20% from 2017 to 2018 (NLEOMF, 2018). Over two-thirds of police officers report being exposed to a life-threatening event, and about 25% of officers have to injure or kill a suspect over the course of their career (Komarovskaya et al., 2011). Increases in police officer fatalities may be linked to the quality of officer training. In order to become proficient at when and how to use a firearm on duty in response to threat, police trainers and academies typically use a use-of-force simulator to train and test cadets on these skills (Saus et al., 2006).

Use-of-force training has been an integral part of police training and testing for more than a century (Bennell, Jone, & Shevaun, 2001), and can bring about permanent changes in an individual's knowledge, attitude, and skills (Noe, 1986). Use-of-force simulations, such as the MILO Range simulator, expose trainees to realistic and integrative scenarios whereby use-of-force decisions improve overall when the participant practices making appropriate decisions using a wide range of use-of-force options (Bennell, Jone, & Shevaun, 2001). Use-of-force simulations are similar to interactive video games in that the subject watches, responds, reacts, and adapts to the presented scenario using a controller in the form of a realistically weighted and sized gun. The MILO Range use-of-force simulation is most similarly compared to a video game that encompasses violence and weapons. Repeated use of the simulation may lead to repeated exposure to interpersonal aggression and perceived threat. Perceived life threat is a significant predictor of development of post-traumatic stress disorder (PTSD) (Blanchard et al., 1995) (Holbrook, Hoyt, Stein, & Sieber, 2001), therefore the long-term effects of this type of training should be analyzed.

Post-Traumatic Stress Disorder

Reduced emotional responding and hyper-arousal both affect functioning in individuals with PTSD. Emotional numbing is a cardinal symptom of PTSD (Litz, 1992) (Asmundson, Stapleton, & Taylor, 2004), and may be the aspect of PTSD most closely related to impairments in interpersonal relationships (Ruscio, Weathers, King, & King, 2002). Disruption of emotional regulation can extend beyond the feelings of fear and anxiety in those with PTSD (Frewen & Lanius, 2006) suggesting that the full range of human emotions may be affected. Further, war veterans that were exposed to trauma and have PTSD display anhedonia, emotional numbing (Kashdan, Elhai, & Frueh, 2006), have deficits in emotional responding (Roemer, Litz, Orsillo, & Wagner, 2001), and have worse perceptual quality of relationships compared to veterans without PTSD.

In contrast, when it comes to hyper-arousal and PTSD Kimble, Fleming, and Bennion (2013) found that hypervigilance (hypervigilance) toward threatening stimuli is a prominent feature of functioning in trauma survivors including soldiers, and Dalgleish et al. (2001) found the same to be true for children and adolescents. It is not uncommon for those with PTSD to report high levels of hypervigilance (Kimble, Fleming, & Bennion, 2013), and hypervigilance for threat is also a main component in anxiety (Dalgleish et al., 2001). The experience of negative affect or hypervigilance in PTSD may depend on individual differences in defensive reactions to threat. The rudimentary schema possessed by all humans is likely negatively impacted by the experience of trauma, and such damages may trigger psychological difficulties that interfere with coping processes (Carlier, Lamberts, & Gerson, 2000).

Desensitization to Repeated Threat

Engagement in violent video games is a significant risk factor for future aggression (Anderson et al., 2008), and low empathy (Funk, Baldacci, Pasold, & Baumgardner, 2004).

Repeated play of realistic violent video games causes desensitization to emotional responses typically elicited from violent acts, and masks feelings of guilt in gamers (Gizzard, Tamborini, Sherry, & Weber, 2016). Furthermore, repeated exposure to violent video games creates the development of aggressive scripts resulting in aggressive behavior chronologically accessible to behavior expression, in turn diluting moral reasoning (Funk, 2005). Carnagey, Anderson, and Bushman, (2007) found that individuals become less physiologically aroused by real violence after playing a violent video game, even for just 20 minutes, and Funk (2005) reported that the United States Army uses an interactive video game that is very similar to a use-of-force simulator to desensitize soldiers during training. A change in an individual's assessment of threat may occur due to exposure to violent content, as a result behavioral outcomes to desensitization can include failure to stop violence, or committing violent acts (Funk, 2005). For a police officer these behavioral results could be detrimental to the safety of the public and the officer. If a change in threat perception occurs due to repeated exposure to violence the individual may have decreased defensive behaviors, decreased feelings of guilt, and decreased moral reasoning when confronted with violence. These outcomes for repeated threat exposure may be the result of the development of decreased emotional responding, and this may potentially lead to affective blunting over time.

Possible Symptoms and Emotional States from Desensitization to Threat

Affect. Negative affect is a state of psychological difficulty characterized by negative moods and emotions that impair adaptive functioning and well-being (Dua, 1993). A study by Dua (1993) found that a preponderance of self-reported negative affect was related to higher levels of stress, depression, poor psychological health, low self-esteem, and poor self-reported physical health. Individuals high in negative affect are more likely to appraise a situation as threatening, report dissatisfaction, distress, and discomfort over time, regardless of the situation, and tend to dwell on their shortcomings (Watson & Clark, 1984). Derryberry

& Rothbart (1988) pointed out that individuals may be predisposed to certain forms of affect due to differences in arousal patterns and negative emotions may produce physiological states that hinder attentional flexibility across situations. Individuals with more overall negative affect have higher levels of emotional uncertainty, while the opposite is true for individuals with more overall positive affect (Dixon, Patton, Fatkin, Gryhovivki, & Hernandez, 2006).

Contrary from negative affect, positive affect is regarded as an expression of positive moods consisting of joy alertness, and interest (Dua, 1993). Those who express positive affect have positive self-qualities, are goal oriented, and have healthier coping styles and abilities than those with symptoms of negative affect (Dua, 1993). Two broad bio-behavioral systems work in the brain, one orients benefits and reinforces behavior in which benefits follow, the other signals costs and reinforces avoidance behavior (Henriques, 2013). Positive affect is a person's approach system, it considers what actions, decisions, and objects an individual values as beneficial to existence, while negative affect is the avoidance system that recognizes risks to existence and responds with fear, anger, and pain when a cost is experienced (Henriques, 2013).

Affective Blunting. Affective blunting is described as the reduced intensity of emotional responses (both positive and negative affect). It can take the form of paucity of gestures, emotional numbing, and unchanging facial expressions (Evernsen et al., 2012), and is displayed as desensitization of emotional responses to external stimuli. After exposure to trauma affective blunting is particularly associated with symptoms of emotional numbing or desensitization, irritability, and a limited range of available emotions.

Desensitization is a key mechanism in explaining potential negative effects of playing violent video games (Funk, 2005). Desensitization to violence is an unconscious process taking place over time defined as the reduction or eradication of cognitive and emotional responses, creating decreased behavior responses to violent stimuli (emotional numbing)

(Funk, 2005). In a study of 262 Dutch police officers who experienced a situation the same as or similar to situations provided in use-of-force simulations Marmar et al. (2006) found that after a real-life critical incident 34% of officers had clinically significant symptoms of emotional numbness, indicating a change in perception. Fanti, Panayiotou, Lombardo, and Kyranides (2016) found that individuals characterized as callous and unemotional have reduced physiological activity when responding to emotions as their responses did not differ when shown a violent film compared to a comedy, indicating less positive and negative affect. In addition, a longitudinal study using fMRI Evensen et al. (2012) found that reduced affect is associated with decreased brain activity. Proper responses to potentially dangerous or threatening stimuli and situations are crucial for law enforcement officer's job function and mental (and in turn physical) health. Emotional suppression or numbing reflects a reduced ability to express emotion and diminished positive affect (Kashdan, Elnai, & Frueh, 2007) and negative affect, most likely occurring due to avoidance of stimuli that may evoke emotions and/or deplete psychological and biological emotional processing (Amdur, Larsen, & Liberzon, 2000). Emotional numbing is a component of human response to trauma (Amdur, Larsen, & Liberzon, 2000) and involves symptoms of PTSD such as having restricted emotional expression, decreased interest in pleasurable activities, and feeling detached from others (Kashdan, Elnai, & Frueh, 2007). A change in threat perception may lead emotional numbing and desensitization, in turn leading to blunted affect over time. This difficultly with emotional expression may impede the ability to function in setting requiring the regulation of emotion. Conversely, there is evidence that repeated exposure to threat and violence may increase a person's situational awareness, leading to hyper-arousal for threat.

Situational Awareness and Threat

Situational awareness is a conscious dynamic reflection of a situation, involving past, present, and future considerations. For law enforcement officers situational awareness

consists of knowing the number of civilians involved in an occurrence, the number of officers, how many suspects there are, if there are any casualties (Saus et al., 2006), and the current level of threat.

Precise decision-making and performance is critical in complex situations, such as those officers are exposed to, and is closely linked to situational awareness (Saus et al., 2006). A heavy toll is taken on the mental capacities of criminal justice personnel during and after they are involved in situations that are characterized by a complex environment with a great deal of uncertainty, a rapidly evolving scenario, and a high degree of fear, personal threat, and potential use of firearms (Saus et al., 2006), such as the scenarios depicted in the simulation. An individual's degree of situational awareness can increase to an unhealthy level due to repeated trauma or exposure to physical danger, if such an increase is seen the individual may start to display psychological and behavioral symptoms such as hyper-arousal (Burgess & Legg, 2017). Police officers are exposed to traumatic events more often and intensely than other occupations, therefore the likelihood of residual effects is greater (Violanti,1997). The level of personal threat experienced is likely to contribute to the degree of psychological symptoms endured by officers. 662 officers provided a narrative of the most stressful critical incident experienced during their career so far, officers whose narratives contained a high degree of personal threat reported more emotional distress and current hyper-arousal symptoms (McCaslin et al., 2006). These results suggest that experiencing personal threat during a critical incident may subject the individual to a greater risk for subsequent distress (McCaslin et al., 2006) by increasing their level of situational awareness to the point that is becomes maladaptive. If situational awareness is increased to an unhealthy degree, hypervigilance to threat may occur to due increased anxiety, stress, and arousal.

Possible Symptoms and Emotional States from Hyper-Arousal to Threat

Anxiety. Anxiety can be described as feelings of tension, worry, or apprehension causing an unpleasant emotional state and autonomic arousal (Bekker et al., 2003). Anxious people probably experience emotions as subjectively aversive and may try to control emotional experiences by using maladaptive interpersonal behaviors as a defense mechanism (Mennin, Heimberg, Turk, & Fresco, 2006). High levels of anxiety are seen parallel with enhanced threat perception in response to external cues (Muris, Merckelbach, Scherpers, & Meesters, 2003) and threat provoked anxiety is known to selectively disrupt the accuracy of working memory performance (Shackman et al., 2006), perception, reactions, and other cognitive processes. Additionally, anxiety may initiate compensatory processing strategies that in turn limit response flexibility (Derryberry & Rothbart, 1998) such as hyper-arousal.

The level of threat experienced by police officers may be a predisposing factor for subsequent anxiety. In a social anxiety experiment individuals with high and low anxious symptoms watched six actors who expressed two positive behaviors, two negative behaviors (threatening behaviors), and two neutral behaviors; the low anxiety group selectively discriminated the positive actors, whereas the high anxiety group selectively discriminated the negative actors indicating an attentional bias to threat (Bogels & Mansell, 2004). An attentional bias for threat is found in many anxious individuals and consists of facilitated attention and difficultly in disengagement (Cisler & Koster, 2010). Individuals that display an attentional bias show increased physiological reactions compared to individuals without attentional bias and individuals with an attentional bias that have been trained to avoid threatening stimuli (Heeren, Reese, McNally, & Philippot, 2012). Aspects of attentional bias to threat previously named are closely related to symptoms of hypervigilance. Hypervigilance focuses attention on potential threats and may maintain a forward feedback loop in which anxiety is increased (Kimble et al., 2013). In this feedback loop anxiety leads to increased

hypervigilance for threat causing a greater level of threat detection, therefore increasing anxiety in turn increasing hypervigilance (Kimble et al., 2013).

Hypervigilance. A manifestation of anxious apprehension is hypervigilance, described as increased readiness to deal with threat during a heightened state of arousal (Somerville, Whalen, & Kelley, 2010). Hypervigilance is an emotional state with the goal of protecting the body against threat. People experiencing hypervigilance exhibit symptoms of increased autonomic activity such as increased respiration rate (Burgess & Legg, 2017) and heightened scanning of the environment for cues related to one's future or potential level of threat or safety (Somerville et al., 2010). Within the realm of anxiety, hypervigilance often refers to specific and intense selective attention for threat-related stimuli (Bogels & Mansell, 2004). Kimble et al. (2013) points out that hypervigilance is understood to worsen or maintain symptoms in anxiety disorders, and many theories suggest that attentional bias to threat and hypervigilance play a major role in anxiety disorders and PTSD. Hypervigilance facilitates quick identification of threat and early activation of defense behavior (Buodo, Peyk, Junghofer, Palomba, & Rockstroh, 2007), therefore anxious symptoms are exacerbated by hypervigilance and individuals affected tend to misinterpret ambiguous situations and exaggerate minor threats, in turn increasing anxious symptoms (Kimble et al., 2013).

Many models of hypervigilance hypothesize that anxious individuals are hypervigilant to threat, more specifically, the individual's attention is directed to stimuli that are relevant to his or her concerns (Bogels & Mansell, 2004). If this attention shift occurs the threat stimuli are likely to maintain their capacity to elicit anxiety and be interpreted as threatening, therefore interfering with social performance (Bogels & Mansell, 2004).

Research on this topic suggests that dysfunctional processes of hypervigilance are automatic, (Bogels & Mansell, 2004), and include strong cortical activation compared to healthy controls (Budo et al., 2007). Autonomic arousal and visual scanning (hypervigilance)

have been demonstrated to be linked and lead to further symptoms of attentional bias, even when the behavior does not result in a conscious increase in anxiety (Kimble et al., 2013). In addition, this study provides support for the role of hypervigilance in increasing visual scanning and arousal, even to neutral stimuli, if the detected stimulus is feared (Kimble et al., 2013). Another study focusing on this concept assigned participants to a neutral, pleasant, or a hypervigilance condition while looking at neutral photos; the hypervigilance group had significantly more fixations and their pupil size was significantly larger indicating increased scanning and autonomic arousal respectively (Kimble et al., 2013). A study assessing hypervigilance in veterans found high levels of hypervigilance in civilian settings in all returning veterans that were assessed, even those without PTSD, suggesting that exposure to threat may be enough to elicit hypervigilance (Kimble et al., 2013).

This concept of the interaction between hypervigilance and anxiety is important for the present study because participants are exposed to a situation in which their concern is preserving their life and the lives of innocent people. Being easily startled, overreacting to other's actions, overanalyzing a situation to be worse than it is, and being overly sensitive are symptoms of hypervigilance (Burgess & Legg, 2017) that may directly affect police work. If the participant already exhibits anxious symptoms, exposure to this kind of scenario may increase attentional bias for threat, leading to hypervigilance, or, the individual may develop anxiety due to repeated threat, therefore being worsened by subsequent threat and developing into hypervigilance.

Psychological and Physiological Measures of Threat Perception

An emotional arousal study using fMRI analysis found that when sampled cortical regions processed emotional pictures (pleasant and unpleasant) there was significantly greater functional activity compared to when neutral images were processed (Lang, Bradley, & Cuthbert, 1998). This finding suggests that emotions and physiological arousal are connected,

and therefore can be measured. Event-related potentials were measured while subjects viewed complex and simple emotionally arousing and neutral photos; emotional photos elicited a larger late positive potential than neutral photos, further, aversive emotional pictures showed larger late positive potentials than pleasant pictures (Bradley, Hamby, Low, and Lang, 2007). For the present study physiological data is measured while the participant preforms the simulation and during a baseline period. During states of human emotion such as anxiety and fear, related primitive autonomic and somatic reflexes are engaged and defensive components of the motivation circuit are active, thus human emotions can be measured bio-electrically as activity (Lang, Bradley, & Cuthbert, 1998).

Respiratory Response. Respiration rate is the number of breaths taken per minute and is a marker that can measure autonomic reactions and arousal. Respiratory response is part of parasympathetic nervous system (PSNS) activity, typically responsible for calming the body. During stressful or fearful situations humans may show signs of hyperventilation. One example is how the respiration system is involved in the flight or fight response, when this response is activated breathing speeds up to allow more air for increased blood flow (VanDiest et al., 2001). In a study of emotional arousal when participants considered music pleasurable (emotionally aroused) or the participant had a 'chills' response significant increases in respiratory rate were recorded (Salimppr, Benovoy, Longo, Cooperstock, & Zatorre, 2009).

Highly coordinated defensive behavioral responses accompanied by appropriate autonomic and respiratory changes can be elicited by potential or actual threatening stimuli in the environment (Dampney, 2015). Alerting stimuli will evoke respiratory responses characterized by respiratory activation (Dampney, 2015), making respiratory rate a marker of arousal. Brief alerting stimuli and prolonged psychological stressors are shown to cause increases in respiratory rate in humans (Dampney, 2015). Bryant, Creamer, O'Donnell,

Silove, and McFarlane (2008) found that patients with PTSD have higher respiratory rate after a traumatic event, and patients were more likely to develop PTSD at 3 months after initial assessment if their respiratory rate was at least 22 breaths per minute, therefore elevated respiratory rate may be a predictor of subsequent aversive psychological effects.

On the other hand, a decrease in physiological activity may be associated with disorders in affect because decreased emotional responding may be linked to a decrease in physiological responding. Individuals that have been exposed to trauma may be expected to have heightened physiological arousal, however there is evidence that blunted physiological activity may occur (McTeague et al., 2010) or even be typical for trauma victims compared to increased physiological activity (Sack et al., 2004). Further, Hopper, Spinazzola, Simpson, and Vander Kolk (2006) found blunted PSNS activity for individuals exposed to trauma, and DePierro, D'Andrea, and Pole (2013) found lower respiratory sinus arrhythmia associated with anxiety in women subjected to interpersonal violence. Decreased physiological responses for participants with mood disorders has been shown (Matsuo, Kato, & Kato, 2002), most likely due to poor stimulus response capabilities, and PTSD has been shown to involve a blunted startle response to threat cues (DePierro, D'Andrea, & Pole, 2013) and involve negative affect that triggers blunted vagal (PSNS) activity (Meyer et al., 2016). Additionally, emotional suppression (reduced expressive behavior and somatic activity) is associated with decreased autonomic arousal such as decreased heart rate (Gross & Levenson, 1993).

Some PTSD patients show increased physiological arousal during threatening imagery, and other PTSD patients show physiological hypo-reactivity probably due to negative affectivity compromising defensive responding (McTeague et al., 2010).

Self-Reporting. A method of assessing perception of threat is self-port questionnaires that evaluate symptoms, emotions, and feelings associated with the mental state in question.

Funk (2005) found an inverse relationship between frequency of violent video game use and empathy measured by a self-report questionnaire and Saus et al. (2006) found high correlations between observer and self-report data supporting the use of self-report rating in studies of factors influencing situational awareness. Another study that addressed cognitive and affective predictors of simulation performance found that personality characteristics during a marksmanship contest measured by a self-report questionnaire indicated participants with a high stability profile would exhibit better simulation performance (Dixon, Patton, Fatkin, Gryhovivki, & Hernandez, 2006). In a study of police officers, contextual threat influenced both self-reported and physiological emotional responses (Pole, Neylan, Best, Orr, & Marmar, 2003) and in a study concerning desensitization Lang et al. (1970) found that patient self-reports were significantly related to the degree of heart rate acceleration evoked by fear images. Results of the previously mentioned study suggest that responses on cognitive and affective assessment surveys provide an indication of the readiness of a participant for use-of-force simulation training, suggesting the degree to which a person may be affected by the simulation in the long-term.

Rationale

Police officers are commonly subjected to life-threatening situations, and recently the number of officers shot by a suspect have risen. To see if the increase in poor outcomes in police-citizen contact is associated with negative effects of officer training the present study aims to investigate officer's threat perception after completing use-of-force training. In order to successfully avoid perceived danger in use-of-force simulations, and real life alike, an individual must have experience navigating critical incidents and must be of sound mind as far as how he or she perceives threat. Anderson et al. (2008) found that exposure to violence changes behavior, scripts, attitudes, and beliefs and Kleider, Parrott, & King (2009) found

that police-relevant threat creates a load on working memory that impairs cognitive processing abilities.

Repeatedly not feeling safe, or feeling threatened could put a person constantly on guard, or could desensitize a person to threat. More specifically, either the presence of hypervigilance symptoms causing extreme or increased perception of threat, or the presence of affective blunting symptoms causing majorly reduced perception of threat is expected due to the simulation's potentially violent nature. Use-of-force simulators realistically re-create scenes police officers encounter so officers can gain experience using these skills to effectively navigate their duties. Little information is known, however, about the long-term effects of these simulations on the psychological well-being of officers. With the goal of assessing police officer training methods, information, and health, the purpose of this study is to see if participation in use-of-force simulations may alter threat perception. The information found will hopefully be used to adapt officer training and recognize psychological symptoms associated with repeated threat.

Engagement in realistic simulations that require use-of-force decision making expose participants to an element of violence and uncertainty about safety throughout the course of the training. Repeated exposure to personal threat such as this may alter the participant's assessment of threat over time. Therefore, the scenarios depicted in the MILO Range use-of-force simulator (created by FAAC Incorporated), may cause an unhealthy increase in situational awareness, causing an increase in anxious symptoms and autonomic arousal consistent with increased perception of threat. On the other hand, repeated exposure to this type of threat may cause desensitization to violence leading to decreased emotional responding (decreased negative and positive affect), consistent with decreased perception of threat. Hence, for the present study two alternative possibilities will be examined: (a) increased anxiety and respiration rate will be markers of increased hypervigilance symptoms

after completing a training session, with the symptoms more prominent at the end of the semester, or (b) decreased negative and positive affect and decreased respiration rate will be markers of increased symptoms of affective blunting after completing a training session, with the symptoms more prominent at the end of the semester.

Method

Participants

Participants are Criminal Justice students at Northern Michigan University enrolled in CJ 223 (Use-of-force and Less Lethal Weapons). This course requires training with an use-of-force simulator that is intended to prepare the students for decision making during life threatening situations during the course of their career. Over the course of the semester each student receives about 45 hours of training on the simulator. During the general description of the study given to the CJ 223 class, students are informed that participation in the study is voluntary and that no negative effect on their course grades will occur for those who do not wish to participate.

Beginning of Semester.

There are 31 participants (6 female, ages 18 – 27) in the pre and post-tests during the beginning of the semester. Immediate effects of the simulation before training are looked at with this group.

Training Period.

There are 8 Participants (2 female, ages 18 – 24) that completed both pre and post-test in both the beginning and end of the semester, this smaller sample size is due to scheduling conflicts and time restraints. Long-term effects of the simulation training are assessed with these participants.

Materials

Questionnaires. A series of questionnaires are used to obtain self-report data of participant's subjective emotional states resulting from participation in the use-of-force simulation. Participants complete the PANAS, the 6-item STAI, and a questionnaire with questions directly about the simulation and participant demographic information.

PANAS. Students complete the Positive and Negative Affect Schedule (PANAS-gen). This questionnaire is completed before and after completion of the simulation, both at the beginning and end of the semester. The PANAS-gen is a 20 question self-report that measures affect by presenting the participant a list of emotions and asking him or her to rate the extent to which they are feeling the emotion in a Likert style from 'not at all' to 'extreme'. Half of the questions related to positive affect and half of the questions relate to negative affect. Watson et al. (1988) found this questionnaire to be reliable and valid.

STAI: Y-6. Spielberger State-Trait Anxiety Inventory (STAI: Y-6 item) (Speilberger, Gorsuch, & Lushene, 1970) is used at the same times as the PANAS. The STAI: Y-s6 item is a self-evaluation with 6 questions that measures current levels of anxiety and associated symptoms. The questions assert a statement such as 'I feel calm', the participant answers in a Likert style that ranges from 'not at all' to 'very much'. The STAI is one of the most frequently used measures of anxiety due to the fact that it is a reliable and sensitive measure (Marteau & Bekker, 1992).

Simulation Questionnaire. The general information questionnaire is given after the simulation is completed during the beginning and end of the semester. This questionnaire includes simple demographic questions and questions about past firearm use in the first section, and the second section is composed of questions posed in a Likert style format meant to measure the participant's subjective experience while engaged in the simulation. Students

choose Strongly Disagree, Disagree, Neither Agree/Disagree, Agree, or Strongly Agree while answering questions related to the simulation.

Partial Video. After the student completes the simulation and the questionnaires noted above they are shown a partial simulation that will be stopped before any significant events occur. Participants are asked Likert style questions about the actor in the video in the first part of the questionnaire, then participants respond with short answers about the actor's demeanor and intentions in the second section. The partial simulation questions are meant to give the researcher an idea of how the participant perceives ambiguous actions of others after they have completed the simulation.

Equipment

Use-of-force Simulation. The use-of-force simulator used in the Forensics Lab to train police academy students is a MILO Range simulator that consists of a 16 x 9 ft. screen that participants stand 8 feet away from and a 1080p resolution projector that is controlled by the instructor's computer. Over the course of the semester (16 weeks) the student is trained to use the simulator. They will be taught how to give and respond with verbal commands during the situation the simulation presents to him or her, and how to hold and use the remote gun. The simulation has a number of weapons associated with varying degrees of force, the weapon used in this study is a 'gun' that is a replica lock 17 pistol that interacts with the simulation. When the participant pulls the trigger on the gun the shots can be heard audibly and visually show up on the screen of the simulation. The actor(s) in the simulation can end up being an innocent bystander, or they can turn out to be threatening and dangerous. Any of the actors in the scenario may be shot, even if they are innocent. At the end of the scenario the simulation informs the participant if their responses were sufficient to correctly handle the situation. The simulator has hundreds of scenarios dealing with many law enforcement agencies in the United States such as, Local, county, and state police agencies, FBI, CIA,

ICE, TSA, Interpol, Homeland security, and many more. The scenario that is used in both the pre and post-tests of this study is one where law enforcement officers have been called to a school where there may or may not be an active shooter. The scene starts in a crowed hallway where the suspect is standing in a doorway. This scenario has three different endings, one where the suspect turns around with a gun, one where the suspect turns around and has a cell phone in his hands, and one where the suspect turns around with his hands up. The ending the participant is given is chosen at random by the instructor, so the participant will not know which ending they will be presented. During the post-test the participants complete an additional scenario based on room clearing skills. Participants search for a murder suspect in a warehouse. This scenario has the same outcome every time; the suspect is found and attempts to shoot the participant. No participant is present while another completes this scenario, therefore the participant will not know the ending and will have to use his or her trained skills to correctly respond.

After completing the scenarios the partial simulation video is played and stopped before anything serious occurs. The video is of a domestic dispute between two males. The partial video ends in violence, however the participant is not aware of this and must respond with what they believe will happen next.

BioPac. To measure physiological data, specifically respiratory rate, a MP-36 BioPac hardware device is used to communicate the physiological data to the researcher's laptop via BioPac Student Lab Software. The ss5LB respiratory effort transducer band connects to the MP-36 box via a cord and the other end with the Velcro band is securely fastened around the participant's chest or stomach depending on their anatomy and where they breathe from. A tool used to mark certain events while data is being collected called a switch is also connected to the MP-36 box. The researcher marks significant events such as when the

simulation starts, when the participant raises his or her gun, and when the participant decides to shoot.

Procedure

The PANAS-gen and STAI: Y-6 item is given to students before and after completing the simulation, and the general information/simulation questionnaire is given after the simulation during the first week of the semester when no formal training has been given (pre-test). On this same day after completing the simulation, students are shown part of a video similar to those shown in the shooting simulators. The video will stop before any substantial events occurs. Students are asked questions about the demeanor of the actor in the video and

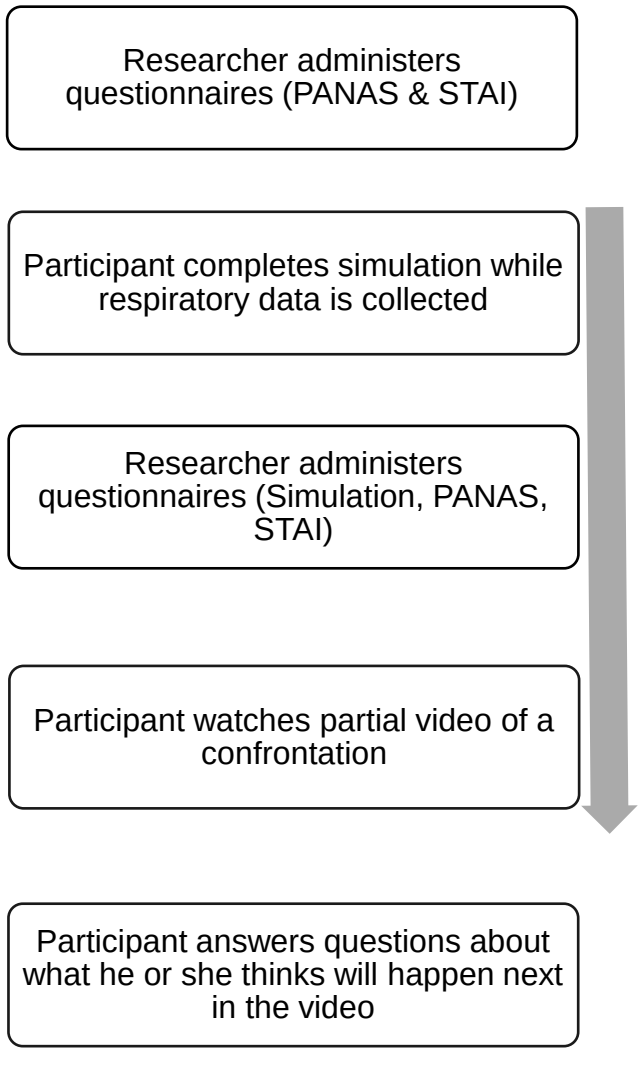

Figure 1. Procedure of Study.

to make predictions about what would have happened next in the video. During the post-test of the study at the end of the semester, students are given the same questionnaire and self-report measures before and after engaging in the shooting simulation that day. Also, students are asked to view another incomplete video and answer the same questions about the video.

In addition, BioPac software and hardware is used to measure respiration rate while students are engaged in the simulation. This occurs during the first week of class (pre-test) as well as after substantial training has occurred (post-test).

Analytic Plan

A paired samples t-test was conducted to examine the difference between before and after the simulation before completing the simulation training (beginning of semester).

A 2 × 2 repeated measures factorial analysis of variance (ANOVA) is conducted to find the influence of two independent variables, simulation and time of semester, and the interaction of the simulation and time of semester on negative affect, positive affect, and anxiety self-report scores. The simulation includes two levels (pre and post) and time of semester consists of two levels (beginning and end). When appropriate, post hoc tests with Bonferroni corrections are conducted on significant results ($p < .05$).

A Pearson correlation was conducted to assess the relationship between participant's respiration rate and their negative affect scores.

A qualitative analysis is used for answers given by participants on the video questions and general information/simulation questionnaire for students that completed the pre and post-tests.

A paired samples t-test was conducted to see if there was a difference from pre to post-test in the beginning of the semester before any substantial training had taken place.

Lastly, a Pearson correlation was conducted to see if there is a relationship between participant respiration rate and the other measures.

Results

Simulation Effect

Participants (n = 30) had significantly lower negative affect scores after the simulation (M = 14, SD = 3.84) compared to before the simulation (M = 15.5, SD = 5.56) (t (30) = 2.09, p < .05) during the pre-test. Similarly, participants had significantly lower STAI scores after the simulation (M = 30.86, SD = 7.25) compared to before the simulation (M = 36.08, SD = 9.97) (t (30) = 2.24, p = .03). There was not a significant difference between participant's positive affect scores before (M = 37.87, SD = 6.33) compared to after (M = 39.84, SD = 7.92) the simulation (t (30) = -1.62, p = .12).

Long Term Effect

For participant's (n = 8, attrition rate = 22) negative affect scores, the main effect of training (time of semester) was significant (F (1, 7) = 10.31, p = .02), participants had significantly lower scores at the end of the semester (M = 16.25, SD = 2.76) compared to the beginning of the semester (M = 30.69, SD = 1.36). Neither the effect of the simulation (one session) (F (1, 7) = .01, p = .93), or the interaction effect (F (1, 7) = .93, p = .37) were significant.

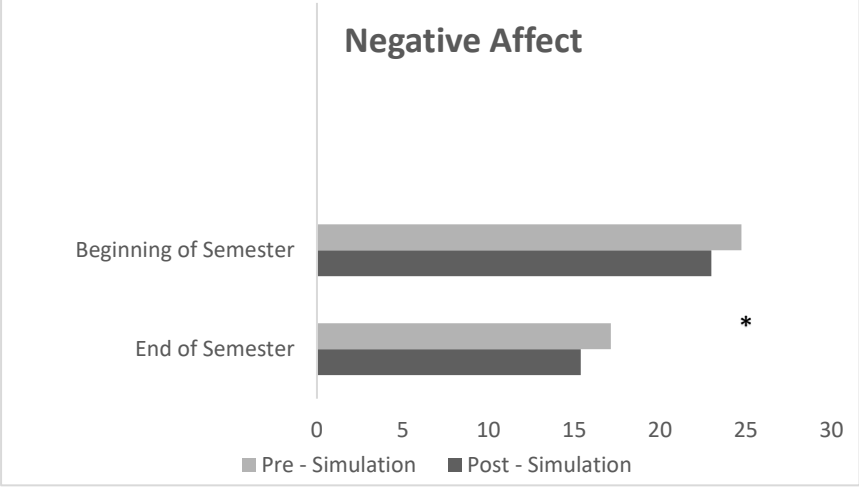

Figure 2. Results for negative affect scores.

Positive affect scores had similar results; the effect of training was significant (F (1, 7) = 38.33, p < .001) and participants had significantly lower scores at the end of the semester (M = 30.69, SD = 1.36) compared to the beginning of the semester (M = 39.5, SD = 4.15). Neither the effect of the simulation (F (1, 7) = .2, p = .67), nor the interaction effect (F (1, 7) = .22, p = .65) were significant.

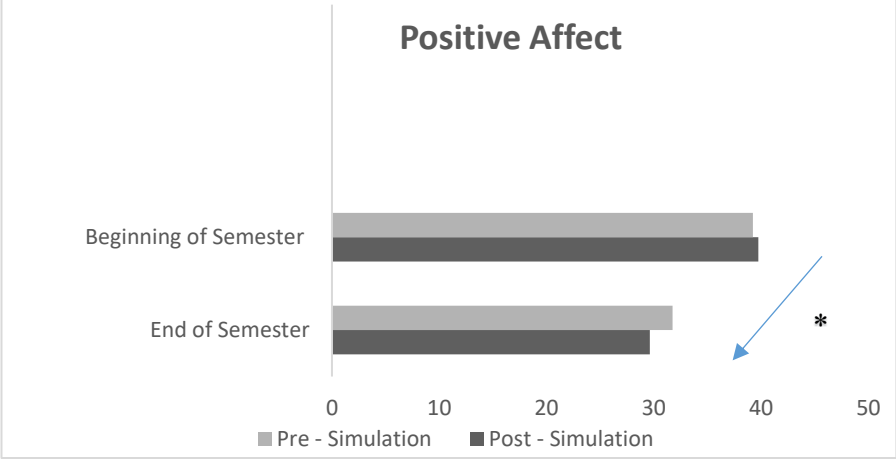

Figure 3. Results for positive affect scores.

Similarly, for STAI scores, the effect of training was significant (F (1, 7) = 16.334, p < .005) and participants had significantly lower scores at the end of the semester (M = 28.92, SD = 5.39) compared to the beginning of the semester (M = 36.05, SD = 5.49). Neither the simulation effect (F (1, 7) = .64, p = .45), nor the interaction effect (F (1, 7) = .33, p = .58) were significant.

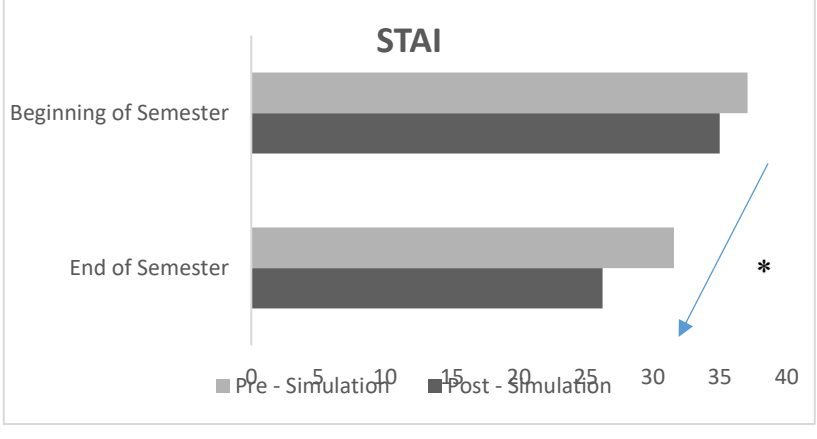

Figure 4. Results for anxiety scores.

Respiration

A positive correlation was found between respiration rate (M = 18.86, SD = 8.78) and negative affect scores (M = 24.75, SD = 3.33) after training (end of the semester) (r = .76, p = 0.03, n = 8). Decreases in respiration rate are correlated with decreases in negative affect scores.

No relationship was found between respiration rate (M = 18.86, SD = 8.78) and positive affect scores (M = 31.75, SD = 1.83) (r = 0.2, p = .64), or respiration rate and STAI scores (M = 31.58, SD = 10.44) (r = .002, p = .1).

Qualitative Analysis

Participants found the scenarios to be less predictable and more realistic and serious at post-test compared to pre-test. Participants also found the actor's intentions to be more threatening and found shooting first to be the best option at post-test compared to pre-test. These main themes were detected by participants substantially changing their answer from pre-test to post-test or from beginning to end of the semester. The four categories previously mentioned had the most answer changes by participants. The overall theme of responses suggests that participants were more strongly influenced by the simulation after they had completed the training and were repeatedly exposed to the threatening scenarios (see table 1).

Participant Rating	BEGINNING OF SEMESTER		END OF SEMESTER		CHI SQUARED
	YES	NO	YES	NO	
The training improved their performance			I I I		
Owns a 0.22 gun or larger		I	I I I I I	I	X^2 = 7.27, p = .007
The simulation scenarios were less predictable			I I I I		X^2 = 7.52, p = .007
More nervous	I	I	I		
Less nervous			I I		
Lethal force needed	I	I I	I	I	
Scenarios more realistic and serious			I I I		
Actor's intentions are sinister	I		I I I I		X^2 = 9.00, p = .003
Description of the event is less excited and detailed			I	I	
Shooting first is the best option	I	I I	I I I I	I	X^2 = 8.29, p = .005

*Tally marks are for participants who expressed changes in their answers over time, neutral or unchanged responses are not included.

Table 1. Qualitative Analysis Results.

Discussion

The aim of this study was to assess if use-of-force training simulations alter police cadet's perception of threat. A significant decrease in negative affect and anxiety was seen directly after using the simulation for the first time, and after a semester worth of training a significant decrease in negative affect, positive affect, and anxiety was found. Respiration rate significantly correlated with negative affect, as respiration rate decreased participant negative affect scores decreased accordingly. These results may be consistent with a decrease in perception of threat.

Simulation Effects

Immediately after completing a simulation scenario participant's self-report scores for negative affect and anxiety were significantly lower compared to before the simulation. This significant change in emotional responding after one session with the simulation suggests that the use-of-force simulation may cause symptoms of desensitization, and therefore decreased threat perception rather quickly and with minimal exposure. In a study of desensitization individuals that were exposed to violence showed symptoms of desensitization that same day in the form of decreased reactiveness (Odgers & Russell, 2017), providing additional support for a relatively fast process of emotional numbing to threat. These findings suggest that it may only take a small amount of exposure to the use-of-force simulator to observe reduced perception of threat, repeated use however may compound these symptoms and therefore cause increased psychological difficulty with threat perception over time.

There is also a possibility that the decrease in anxiety, and possibly negative affect, is linked to feelings of relief after completing the simulation. If the participant was nervous to use the simulation for the first time he or she, therefore, may be less anxious after completing it. More research is needed to confirm the cause of the decrease in negative affect and anxiety after completing the simulation, however one sign pointing toward desensitization is that

participants who have been trained on the simulator and have used it repeatedly show the same pattern of decreased emotional responding.

Long-Term Effects

Over the course of the semester of use-of-force training participant's self-report scores for negative affect, positive affect, and anxiety significantly decreased from beginning to end of the semester. It should be noted again that only a small number of participants completed both of the beginning and end of semester sessions. The significant decreases of self-reported emotional responding may still indicate that the training period created desensitization to threat and therefore a decreased perception of threatening stimuli. This significantly reduced intensity of reported emotional responding is consistent with the presence of affective blunting (Eversen et al., 2012), and emotional numbing of this type is a main symptom of PTSD resulting from exposure to violence (Frewen & Lanius, 2006). It is possible that the decrease in emotional responding found with the current study's participants may be a result of trauma-related impairments due to perceived life threat. Similarly, Mrug, Madan, and Windle (2015) found that exposure to repeated threat is linked to desensitization as evidenced by low reporting of internal responses after threat exposure. Also in line with the present study's findings are the previously mentioned concepts brought to light by Gizzard, Tamborini, Sherry, and Weber (2016) and Roemer, Litz, Orsillo, and Wagner (2001). Repeated engagement in violent interactive games is shown to cause habituation to the encountered violence, in turn decreasing the ability of the individual to express emotions such as guilt, additionally this decreased ability to elicit emotional responses generalized to other experiences (Gizzard, Tamborini, Sherry, & Weber, 2016), and those that experienced trauma reported more intense and frequent withholding of emotional responses when compared with an individual who has not experienced a traumatic or life-threatening event (Roemer, Litz, Orsillo, & Wagner, 2001).

Increased anxious symptoms are associated with an increase in threat perception (Muris, Merckelbach, Scherpers, & Meesters, 2003), therefore it is also true that a decrease in anxious symptoms is associated with a decrease in threat perception. If a reduced perception of threat does occur from repeated exposure to threatening stimuli it would likely follow that an individual would worry less about the threat or potential threat, and therefore would show a decrease in anxious symptoms. In line with this notion is the discovery that those with high levels of negative affect are more likely to see a situation as threatening and those with high levels of positive affect typically have better coping mechanisms (Dua, 1993). If desensitization occurs it seems intuitive that low levels of negative affect are linked to a decrease in threat perception and low levels of positive affect are linked to less effective coping styles. Further, Weinberg and Sandre (2018) found that decreased positive affect is associated with blunted threat-elicited late positive potential. The lessened intensity of reporting affect and anxious symptoms after completing training on the use-of-force simulation indicates that the simulation has long-term effects upon those that use it. If officer experiences diminished perception of threat and less effective coping styles his or her life, the lives of other officers, and the lives of civilians could be in put jeopardy even during routine interactions with the public. A reduced ability to respond to threat stimuli may translate to the officer being less willing or able to help those in need. Providing officers with resources and tools to support positive coping styles may help to counter-act the negative effects of use-of-force training.

The possibility of participants becoming more familiar with the simulation and therefore less anxious must not be overlooked as the cause of decreased anxiety from beginning to end of semester. If this notion is true it would likely follow that the participants would see the scenarios as more predictable, which is the opposite of what the current study found. Participants also reported that shooting first was the best way to handle the scenarios more frequently at the end of the semester. If participants were less anxious due to becoming more

familiar with the scenarios it is likely that they would consider less extreme force options before using lethal force.

Overall Effects

The overall decrease in emotional reporting may be related to affective blunting as a result of decreased emotional responding associated with desensitization due to repeated threat exposure, consistent with the second hypothesis in the present study. In support of decreased emotional responding due to repeated threat exposure a study of violent video game users showed that users habituated to threat stimuli after repeated use (Montag et al., 2012) and those repeatedly exposed to interpersonal violence show symptoms of desensitization and are at risk for viewing violent behavior as normal (Tarabah, Badr, Usta, & Doyle, 2015). Therefore, a major concern with using use-of-force simulations to train police cadets is decreasing threat perception to an unhealthy level, with violent or anti-social tendencies emerging due to the experienced desensitization.

Participant scores for positive affect were very close to the median score for the PANAS-gen, with only about 4 participant's having higher than median scores in both the beginning and end of the semester. The range for the PANAS-gen is 10 – 50, and none of the higher than median scores were over 10 points higher than the median. For negative affect all participant scores were below the median score and ranged between 15 and 25 for the beginning of the semester, and 15 through 24.5 for the end of the semester. The higher the score is for positive or negative affect the more positive or negative affect the participant is reporting, therefore positive affect resembled normative data whereas negative affect was substantially lower than normative data.

Anxiety scores were lower than what is considered normal for the STAI. Only three participants scored higher than normal in the beginning and only two scored higher than normal

in the end of the semester. All other participant scores were substantially lower than 'normal' in both the beginning and end of the semester .

Participant Short Answers. The nature of the simulation questionnaire and video questions assessing the participant's subjective feelings help to gain additional insight into the emotional state of the participants. Overall, students found the simulation scenarios to be more unpredictable, realistic, and serious after completing a semester of use-of-force training. This indicates that over time participants perceived the interactions in the simulation as more uncertain and the outcomes of the interactions as more consequential. In support of this interpretation is the fact that after training compared to before, participants described the best method for completing a scenario successfully as shooting the actor before he or she had a chance to shoot the participant. This finding suggests that the participant's perception of the simulation changed as a result of repeated use, with the simulation seeming more realistic and risky, and the best method of completing the simulation as using violence. These short answer responses provide more support for the desensitization theory because those that are desensitized to violence see violence as more acceptable and normal, and may partake in violent acts more readily than someone who does not have an altered perception of threat.

Respiration Rate. Although respiration rate was not able to be compared between beginning to end of the training period due to technical difficulties including motion artifacts in the beginning of the semester, the respiration data from the end of the semester session was utilized to look for a correlation between the participant's respiration rate and the other measures of affect and anxiety. A positive correlation between participant's respiration rate and negative affect scores is seen; as negative affect scores decrease participant's respiration rate decreased as well. Wuyts, Vlemincx, Bogaerts, Van Diest, and Vanden Bergh (2011) found similar results in their study where decreased sigh rate was found to be associated with decreased mental stress and negative affect. Additionally, decreased physiological arousal has

been recorded in individuals that have been exposed to trauma (McTeague, 2010) (Sack, 2004) and physiological desensitization to violence in seen for those who commonly play violent video games (Carnagey, Anderson, & Bushman, 2007).

A decrease in physiological arousal may be evidence of a lowered perception of threat as less responding reflects less alertness and a lowered amount of resources allocated to discovering or removing threat. Becoming less physiologically aroused to threat stimuli indicates habituation to that type of stimuli, over time possibly leading the person to become desensitized as threat or violence may become seen as a normal occurrence in the person's life. The decrease in respiration rate as negative affect decreases, coupled with decreased emotional responding over the course of training provides strong evidence for a decrease in threat perception as a result of use-of-force training with the simulation.

Interestingly, respiration rate did not correlate with positive affect or anxiety scores. Respiration rate is known to change dramatically as a result of emotional changes, typically with a more rapid rate during arousal. Fear and anxiety create distinct autonomic responses, including changes in respiration rate in order to avoid threat and preserve life (Homma & Masaoka, 2008). It is plausible that positive affect did not correlate with respiration rate due to positive emotions such as happiness not creating the same autonomic reactions as negative emotions such as fear. As for anxiety scores, one possible explanation for the lack of correlation may be that respiration rate and trait anxiety are known to correlate (Homma & Masaoka, 2008), however, the STAI measures state anxiety instead of trait anxiety. Further, respiration rate typically increases as subjective anxiety increases due to the individual becoming more alert or aroused, but the opposite may not be true for those who are desensitized. An individual experiencing less subjective anxiety may not notice a difference in their respiration rate as he or she is probably functioning at a normal or below normal level of arousal. Negative affect

encompasses a wider variety of emotions, and therefore may be more connected to respiration than low levels of anxiety alone.

Implications

The lasting effects of a decreased perception of threat in police officers may be aversive to the officer, the public, and the public's perception of law enforcement. A decreased perception of threat could introduce issues such as increased aggressiveness or violent tendencies of the officer during interactions with others. Increased propensity for violence or aggression can effect the use-of-force an officer finds as reasonable, the officer's interpersonal relationships, and their grasp of how risky a situation actually is. An individual that continues to work on a police force after they have known aversive symptoms can exhibit reduced self-control, escalated use-of-force, anger, and irritability (Sugimoto & Oltjenbruns, 2001). This indicates that contacts with the public may end more negatively when the public is interacting with an officer with a decreased perception of threat. Repeated exposure to threat is strongly correlated with increased police use-of-force (Manzoni & Eisner, 2006), therefore it is likely that an officer desensitized to violence may use a higher level of force than is actually required. This not only has legal implications for the department and the officer, but may put citizens and other officers at risk for injury or death that may have otherwise been avoidable or not present.

Officer's personal relationships may also be affected, officers exposed to critical incidents have worse health outcomes, and more intimate partner abuse than those not exposed (Gershon, Barocas, Canton, Li, & Vlahov, 2008). When close personal relationships are in jeopardy this opens the door for may other negative emotions and actions that may further affect the officer's perception of themselves and other's. When dealing with the inherent nature of police work a support system for the officer may be highly beneficial. If the officer's interpersonal relationships are tainted the support system may become weakened, and the

officer may feel alone or have difficulty relating to others, probably escalating the initial symptoms of desensitization.

Additionally, if an officer's perception of threat is lowered his or her perception of risk during a situation is likely also lowered. Increased risk-taking behavior is correlated with exposure to continuous or repeated threat (Pat-Horenczyk, Peled, Miron, Brom, Villa, & Chemtob, 2007). Increased risk-taking behavior could be detrimental to an officer due to their already risk-filled occupation.

As mentioned above, the decrease in anxiety scores, and possibly the other measures of positive and negative affect, could be related to diminished feelings of nervousness after completing the simulation. Directly after completing the simulation before significant training (simulation effect) participants may feel a sense of relief after finishing their engagement with the threatening scenario, therefore reporting less anxiety after the simulation compared to before. Similarly, after participants completed the semester of training (long-term effect) they reported less anxiety compared to the beginning of the semester. Participants may have been anxious about using the simulator initially, and then became more familiar with the simulation over the course of the training and therefore were less anxious about engaging in it. A main theme identified within participant's short answers is that they saw the scenarios as less predictable over the course of training. This view does not support the idea that participants became familiar with the simulation and therefore less anxious, therefore more research is needed to confirm the cause of decreased emotional responding.

Limitations

A limitation of the present study is the small sample size of the end of the semester group due to some participant's inability to complete both pre and post-tests at the beginning and end of the semester because of restricted availability of the simulator (scheduling conflicts). Ideally, all 30 participants would have completed the pre and post-tests during the

beginning and end of the semester, however due to scheduling conflicts with practical exams a smaller number completed the end of the semester session.

Also, the present study is mostly based on self-reporting of emotions. If another measure was introduced such as expert observer ratings or enhanced physiological recordings this would lend more credibility to the results. A control group of a similar criminal justice class that does not use the simulator also could have beneficial to compare results with. If the same pattern of decreased emotional responding is not found in the other class this may be evidence pointing to the simulator as the cause of the decrease in emotional responding.

Lastly, the small number of successful physiological recordings is a limitation of this study. Due to the nature of the simulation participants are required to move their arms and body, however this is counter-intuitive to recording physiological data and results in motion artifacts and improper recordings. A device that can accurately record physiological data while a participant is in motion is needed to provide the best possible data.

Future Directions

Future studies on this topic should address the relationship between emotional responding and physiological responding after prolonged exposure to threat to gain a clearer picture of human reactions to threat. Individuals with disrupted emotional regulation are at risk for aggression and violence (Davidson, Putnam, & Larson, 2000), and emotional desensitization to violence can lead to serious violence in the future (Mrug, Madan, & Windle, 2016). Due to the affected population in the present study being tasked with the safekeeping of the public it is extremely important to obtain a complete understanding of how and why desensitization to threat occurs as a result of use-of-force training on a training simulator. If the present study's results are replicated this will provide more concrete evidence of decreased perception of threat over time due to repeated exposure to threat.

Future studies should also aim for a larger effect size, for all participants to

complete the study, to include a control group to compare findings against, and to analyze different types of use-of-force police training to determine their affect upon officers. To some extent desensitization may be necessary for an officer to engage in force, however the degree of desensitization resulting from the simulation may extend past healthy levels and therefore may lead to aversive effects upon the officer, the public, and those close to the officer. Officers are trained how to assess threat, coupling this training with training in coping strategies and positive self-reflection could possibly help prevent some of the negative effects associated with a large decrease in threat perception, more research is needed to determine the best method of counter-acting unwanted effects of desensitization.

Additionally, a longitudinal study that measures participant's threat perception before, during, and after training, and after an officer has started their career on the force will provide information not only about how the training affects the officer, but how these effects are displayed during their interactions with the public. It is important to examine how a change in perception of threat may affect an officer's career because the lives of citizens as well as the lives of the officers are directly affected. In order to avoid detrimental consequences a firm understanding of how use-of-force training affects threat perception is needed.

A study that employs more physiological measures such as Galvanic skin response, heart rate, and/or neuroimaging in addition to self-report measures will provide more insight into how the body and mind react to threat over time. With a greater number of markers, emotional and physiological, more evidence for or against desensitization to threat is provided. Also, an assessment by a psychologist informed about how threat affects humans, both before training and after training may be beneficial as their report about the individual may be able to verify or debunk the accuracy of the self-reported emotional states.

Lastly, to verify if the cause of the decrease in emotional responding is due to desensitization and therefore a lowered threat perception, or simply feeling less anxious after completing the simulation for the first time, and therefore also over time after becoming familiar with it, the present study should be replicated with an additional measure. Before and after completing the simulation, video questions, and self-reports participants would watch a violent video while their brain activity is recorded (fMRI may be best). Structures know to be involved in anxiety and threat perception would be compared, if the neuroimaging indicates decreased activity in regions associated with threat perception before compared to after the simulation, and at the beginning of the semester compared to the end we may conclude that this difference in activity is due to desensitization to violence. If there is not a significant change in the participant's brain activity in response to the violent video, or if there is a change in regions associated with anxiety it might be concluded that the participants were just less anxious after the simulation and therefore over the training period as well.

Conclusion

In summary, it appears that engagement in a use-of-force simulation for the purpose of police training decreases the user's perception of threat. Immediately after the simulation participant's self-reported negative affect and anxiety was significantly lower compared to before the simulation, whereas after a semester of training with the use-of-force simulator participant's self-reported negative affect, positive affect, and anxiety was significantly lower after the 16 weeks of training compared to before. Participant respiration rate was positively correlated with participant negative affect, where respiration rate decreased as negative affect decreased. The reduction in emotional and physiological responding, coupled with the change in participant's short answers over the course of the training as a function of participating in the simulation provides support for desensitization to threat stimuli, and therefore a lowered perception of threat.

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Appendix A

IRB Approval Form

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MEMORANDUM

TO: Ellyse VanDyke
Psychological Sciences Department

CC: Adam Prus
Psychological Sciences Department

FROM: Lisa Eckert, Ph.D.
Interim Dean of Graduate Education and Research

DATE: July 25, 2018

RE: Extension for HS17-913
Original IRB Approval Date: 12/11/2017
New Project Expiration Date: 12/11/2018
"Threat Perception Alteration resulting from Shooting Simulation Training"

Your modification to extend "Threat Perception Alteration resulting from Shooting Simulation Training" has been approved under the administrative review process. Please include your proposal number (HS17-913) on all research materials and on any correspondence regarding this project.

Any changes or revisions to your approved research plan must be approved by the IRB prior to implementation.

Please submit a Project Completion Form for Research Involving Human Subjects at the conclusion of your study. If you do not complete your project within 12 months from the date of this approval notification, you must submit a Project Renewal Form for Research Involving Human Subjects. You may apply for a one-year project renewal a maximum of four times.

All forms can be found at the NMU Grants and Research website:
http://www.nmu.edu/grantsandresearch/node/102
If you have any questions, please contact the Office of Graduate Education and Research.