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Problematic police performance in critical shooting incidents: Evaluating an innovative reality-based firearm training approach to develop stress adaption

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Research Article

ABSTRACT

Firearm training across global police/law enforcement organisations has been dominated historically by a traditional marksmanship orientated model, which has been continuously criticised as failing to prepare police recruits for decision-making and firearm operation in critical incidents. An ongoing doctoral study outlined in this paper examines what is problematic with current training approaches and evaluates an innovative reality-based firearm training program to compare its effectiveness with the traditional model. The study, with a focus on adapting the human threat response to stressful incidents, uses a range of established stress theories to inform and guide a mixed methods approach that examines program participants' progress. Early study results show promise in adapting participants' threat responses and improving operational performance.

Keywords: *Reality-based training, police firearm training, stress theories, human threat response.*

INTRODUCTION

The traditional police[1] use of force (PUOF) firearm training model has been challenged continuously by researchers in recent decades (Alpert et al., 1997; McManus, 1970; Milton et al., 1977; Morrison & Vila, 1998; Scharf & Binder, 1983). Primarily, criticism has focused on poor operational performances and the widespread false assumption that "... the required firearm

[1] The terms *law enforcement* and *police* are used interchangeably for contextual flow. The term *police* includes any authorised, trained, and suitably empowered representative of the legitimate government. In addition to traditional police organisations, national security, border protection, close protection, and counter terrorism units are considered *law enforcement* for the purposes of this study.

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training [traditional model] is an adequate preparation for a deadly force encounter" (Thomasson, 2013, p. 4). There has been minimal change and operational improvement to this marksmanship-based model since the emergence of mandatory firearms training for police in 1959 as part of the California Police Officer Standards and Training (POST) (Werth, 2009).

While only a small percentage of PUOF[2] encounters are excessive or inappropriate, the issue of causation (why police use excessive, ineffective, or inappropriate force) remains in need of a compelling answer that satisfies the great majority of identified cases of poor judgement in PUOF encounters and particularly those using firearms. This perspective is supported by data from the United States (US) that, during 53+ million police/citizen encounters each year force is only used, or threatened with use, by police in approximately 1.3% of all police/citizen encounters (Davis & Langton, 2018). Furthermore, lethal force is applied in a small fraction of those encounters (Lersch & Mieczkowski, 2004); this represents over 700,000 encounters where force is used or threatened each year. This means that lethal force (primarily the use of firearms) is used in less than .00002% of all police encounters or .15% of those encounters where force was originally threatened and ultimately applied.

These figures provide context to the issue. It is not suggested that every use of force encounter is ineffective, inappropriate, or excessive, and in fact, the great majority of interactions are not alleged to be unreasonable (Rudovsky, 2017). The use of deadly force is appropriately described as a "rare event" (White, 2006, p. 304). Despite this seemingly small percentage, approximately 1000 lives have been taken by police each year consistently over the last eight years in the US (Post, 2024). Approximately 65 police officers are feloniously killed (murdered) in the line of duty each year on average, at a rate of just over one per week. The US has had over 2,000 police officers killed in the period 1988–2019 (34 years) and 53,000 assaulted annually; approximately one assault every ten minutes (US DOJ – LEOKA Report, 2019), making this a significant issue worthy of study.

This paper aims to outline a current doctoral study by the lead author, which specifically focuses on evaluating the current traditional firearms training model and an innovative reality-based training (RBT) program. More specifically, this study examines the adverse impact of the

[2] An internationally accepted or utilised Police Use of Force (PUOF) definition does not exist (Wortley et al., 2021) but is defined differently across jurisdictions and countries. The USA International Association of Chiefs of Police (IACP, 2001) defines PUOF as the "… amount of effort required by police to compel compliance by an unwilling subject" (p. 66). In the UK, PUOF is defined by the conditions of application, being built around the concept of reasonableness and the necessity to consider force from the officer's perspective (United Kingdom Statutory Instruments on The Criminal Justice and Immigration Act 2008). Australia defines PUOF in terms of reasonableness (ANZPAA, 2013), but the New South Wales Police (NSWPOL) define PUOF further as "… physical force or other techniques, including a weapon, instrument or implement, [used] in the lawful execution of their duty" (Johnson & Johnson, 2023, p. 10). For the purposes of this paper the broader IACP interpretation is applied.

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human threat response[3] (HTR) on police officer responses when using firearms in critical incidents and ways of adapting their responses to improve performance and decision-making under stress. The working hypothesis is that the *panic* response to a critical incident is potentially a primary causative issue that underpins poor decision-making in such incidents.

This paper discusses important background issues and research informing this study, outlines selected initial study results, and provides an overview of the proposed Reality-Based Training Initiative (RBTI) for police academy courses and ongoing skill development. Importantly, while there is a focus here on skill acquisition with firearms, it is proposed that adaption to HTR can also inform crucial improvements to all PUOF[4] training situations and prepare police to provide a more effective operational response and develop resilience to acute stress in critical incidents. The RBTI is more aptly described as a training methodology oriented towards developing self-efficacy than a shooting or PUOF program. RBTI methodology can be applied to any part of an officer's duties that will likely be carried out under stress in various contexts.

BACKGROUND AND CURRENT PUOF OPERATIONAL STATISTICS

Unfortunately, most police officers will never find out if their training has truly prepared them for the realities of a critical incident until they experience a life-threatening event. This is not the time or place to discover whether your training has prepared you physiologically and psychologically for the realities of fighting to protect your or someone else's life. Ideally, any PUOF training model should be validated to reliably produce the kind of acute stress response experienced in a life-threatening event but in a controlled and safe training environment.

Research has examined aspects of police shootings to determine why PUOF is ineffective, inappropriate or excessive during critical incidents, with a range of potential causative issues or variables identified, including racism, sex, training, age, and officer experience (Aveni, 2003; Gillespie, 2012; Hine et al., 2018; Lewinski et al., 2015; Morrison, 2006; White, 2006). PUOF legislation, policy and use of force continuums have also been examined (Benton, 2018; Cole, 2020; Ryan, 2017) but, while acknowledged, fall outside the scope of this paper. The impact of PUOF instructors' skills, experience, and development, along with the

[3] In a critical incident the brain's threat centre (Thalamus) *acknowledges* a threat and activates several significant actions within the brain (via the Limbic System) and body. The first critical event is the HTR, which is an instant and subconscious reaction to external stimulus. The physiological and psychological impact of this temporary reorientation means the brain is not operating in its optimum functional state. This temporary shift impacts cognitive processing and decision-making, including perceptual distortions, where the brain may simply be overwhelmed if not prepared and interpret events from a biased perspective (Service & Programs, 1998).

[4] There is a specific focus on firearms in this study rather than the broader field of PUOF for simplicity and because relevant organisations retain more detailed records of firearms use.

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content and delivery of training programs has also been a key research issue, which this study seeks to extend.

More specifically, recent studies examining the *detrimental impacts* on critical thinking and physical performance under stress have questioned the traditional marksmanship-based firearm training model[5] (Novy, 2012; Stafford, 2019). In addition to diminished critical thinking, officers cannot aim firearms as per traditional training because of HTR *effects*. These effects include tunnel vision, reduced blood flow to the eyes, deactivation of the ciliary muscle critical to focus adjustment near/far, and the loss of complex and fine motor skills essential to focus on iron sights and align them with a target (Siddle & Grossman, 1998).

In the US, there is limited accurate national data on police shootings despite a Presidential direction (DOJ – President's Commission, 2015), which is problematic for research. Washington Post reporter Tom Jackman reported that "… for the second straight year only about 27% of police departments shared data with the FBI lead National Use of Force Data Collection Program" (2021).

Several media-based, academic, and community advocacy group databases contribute to transparency. While not conclusive of all data, these organisations generally agree US police agencies have killed more than 1000 people per year since 2015 (Washington Post, 2023) and over 30,000 since 1970 (Naghavi, 2021). There is limited data on how many people are wounded as a result of police shootings. The levels of police shootings in Australia are lower than in the US; however, there has been a significant increase in Australian police shootings since 2019 (Goldsworthy, 2021; Zillman, 2023).

Both US and Australian police continue to use the traditional model for firearms training and an annual, or at best semi-annual, assessment to a minimum standard, albeit with some adaption of ad hoc scenario-based training. Australia has now begun to emulate the US in wearing personal body armour by uniformed police as more standard practice. Such a move could be considered a silent acknowledgement of the changing threat model operationally but without significant changes to firearm training.

HISTORY OF FIREARMS TRAINING RESEARCH

Cojean et al. (2020) undertook a comprehensive review examining 923 articles on PUOF decision-making. Conclusions drawn indicate that from an officer's perspective, the most predictive factor for PUOF application was the level of resistance and the suspect's behaviour. The officer perspective, as also concluded by Hine et al. (2018), is of significant interest due to the potentially subjective influences on decision-making within situational contexts and the

[5] For the remainder of this paper, this is usually referred to as the *traditional model*.

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potential for significant influence by distortive effects of hormonally induced stress in a critical incident.

Researchers (Aveni, 2003; White, 2006; Morrison, 2006; Gillespie, 2012; Lewinski et al., 2015; Hine, 2017) have been exploring the issue of poor performance or decision-making in police shootings since the 1970s. Further historical studies provide both confronting and informative results relating to poor shooting accuracy rates that often fall below 50% (Fyfe, 1978, 1988; Geller & Karales, 1982; Geller & Scott, 1992). Other studies specifically highlight that the traditional model does not adequately prepare police for operating firearms in critical incidents (Alpert, 1989; McManus, 1970; Milton et al., 1977; Scharf & Binder, 1983).

A cornerstone declaration regarding firearms training and its relationship with operational performance arose from Morrison and Villa who stated, "... contemporary police doctrine and techniques might be ill-suited for preparing officers for gunfighting" (1998, p. 514). They support this statement through data and examples of operational firearms performance from various US police organisations (ibid, pp. 523–524). These authors examined the evolution and foundation of firearms training within law enforcement and demonstrated how little accuracy rates have improved in the past century despite the introduction of formal training programs and improvements in weapons and ammunition. Their research demonstrated that police hit rates[6] are similar to those of criminals shooting at police and concluded, "...there were serious reasons to question the validity of police recruit and in-service handgun training activities ..." (ibid, p. 524).

These conclusions are supported by contemporary research (Aveni, 2003; Gillespie, 2013; Lewinski et al., 2015; Morrison, 2006; Staller et al., 2022; White, 2006). Other authors also highlight the impact of stress on reducing shooting accuracy (Donner & Popovich, 2018; David Klinger, 2012; Landman et al., 2016). Studies are hampered by a lack of available data from reluctant police organisations wishing to avoid public scrutiny (Oramas Mora, Terrill & Foster, 2023), with no publicly available data from Australian police organisations.

This historical research consistently indicates significant problems with firearms training and limited development of operational skills, including minimal consideration of stress impacts on capabilities. There is likely no single underpinning cause for poor performance or decision-making by police in critical incidents, with a range of causative issues having at least some situational or contextual validity (Mora et al., 2023). However, an improved training method incorporating stress adaption has significant potential to enhance decision-making under stress and save hundreds of lives (Baldwin et al., 2022), while enhancing officer recovery from critical incidents.

[6] The terms *hit rate* and *accuracy* are often used with a different contextual foundation by researchers. Hit rate generally refers to at least one disabling hit upon the target regardless of rounds fired and accuracy relates to rounds fired relative to hits (Donner & Popovich, 2018).

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The HTR, with the accompanying and potentially overwhelming psychophysiological effects of chronic and acute stress, significantly contribute to poor decision-making and physical performance, resulting in ineffective, inappropriate, or excessive force due to constructed cognitive bias (Akinola & Mendes, 2012; Baldwin et al., 2022; Hine, 2017). As previously stated, the working theory of this study is that the *panic* response to a threat, as an instinctive survival mechanism within the HTR, is a potentially significant factor applicable across a large spectrum of examined events and, as such, is a key problematic issue that researchers need to address.

Additionally, the Biopsychosocial (BPS) model of Challenge and Threat (Blascovich & Tomaka, 1996) suggests that when an individual is presented with a situation they assess as within their *coping resources* (skill level), they see the situation presented as a challenge. Conversely, when the opposite assessment exists, the situation is perceived as a threat and performance is correspondingly affected (Kelley et al., 2019). Accepting this theory follows that a high level of training (increased skill) would logically lead to increased self-efficacy; belief in self and ability, with a balanced understanding of limitations (Bandura, 1977). This approach challenges calls for increased de-escalation training and a reduced focus on PUOF, the effects of which have provided only limited improved outcomes (Engel et al., 2020). Following this logic, enhancing self-efficacy can encourage greater openness to de-escalation opportunities during critical incidents because officers would potentially be less overwhelmed or panicked. Essentially, confidence in their skills can enable them to attempt options they might not have previously felt comfortable exploring in a life-threatening situation.

THE TRADITIONAL (CURRENT) FIREARM TRAINING MODEL

Much like the absence of a universally accepted definition of PUOF, the *traditional model* used globally has no agreed upon name and is simply an organically evolved training model influenced by military and sports shooting groups over many decades. This model is premised on a skills-based format and a marksmanship focus, with annual recertification to a minimum standard of hits on paper targets as the core means of competency assessment.

Qualification and certification testing in this model is mostly under sterile range conditions, with minimal or no operational simulation or acute stress that can be measured accurately, easily, and reliably. In simple terms, participants train to pass a test rather than develop measurable operational capability under authentic conditions (Guillaume, 2010). The standard achieved in recruit training remains the standard throughout their career, with no expectation to improve beyond the minimum standard. These minimum standards are usually prescribed in the US by way of state legislation POST standards, while Australia has no legislated minimum standards.

Establishing a minimum standard for firearms qualification scoring is well intentioned and aims to establish a quality control point, but this approach is a double-edged sword. Most participants focus only on achieving that minimum standard and considering the unrealistic

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training conditions, this approach can instil a false sense of complacency or confidence within participants and their organisations. This conclusion continues to be supported by performance statistics, which indicate police accuracy with firearms in critical incidents remains as low as 20%, meaning potentially four out of every five rounds fired missing their target (Aveni, 2003; Morrison & Villa, 1998; White, 2006).

PUOF training in police academies in the USA currently accounts for around 25% of the total recruit course times, with 40% of this time dedicated to firearms training (Reaves, 2016). As such, significant time and resources are committed to training programs that are questionable in their effectiveness. While the time dedicated in recruit training programs does not correlate with the frequency with which force is actually used in operational situations (Davis & Langton, 2018), it remains a highly contentious policing issue in respect of conflict with the community and lives lost or significantly impacted as a result of poor practice.

More specifically, there are some problematic aspects within the traditional model's structure/content and delivery method. In relation to structure and content, the current guidance in firearm training centres on teaching police officers to use minimum force[7] rather than evaluating what should be reasonable at the time, potentially leading to confusion and the misapplication of force. The traditional model also teaches questionable techniques; relating to shooting stance and aiming, which have developed organically and without appropriate scientific rigour.

These fundamental problems with the traditional model stem from the widespread use of the *marksmanship shooting style*, which emerged from the military after World War II (WWII) and was adopted from US target shooting sports clubs (Westmoreland, 1989). A notable technique used in this style is the *weaver stance* and associated firearm sight alignment with one eye, which is highly vulnerable to HTR distortions. Therefore, while these techniques are beneficial in a sporting environment, they are less than ideal for police engaged in a critical incident.

In contrast to the marksmanship style, there is a second approach called the *combat shooting style,* which originated from special forces units' close-quarter fighting in WWII. This style has a different focus on aiming, using an *acceptable sight picture* instead of a more precise sight alignment and with both eyes open and a more direct facing isosceles stance. This style is used in specialist police and military units, and while some aspects of it have been assimilated into general police training, the marksmanship style remains dominant, especially in the assessment and recertification phases.

The combat shooting style provides greater promise in performance under stressful conditions, being more authentic (natural or instinctive) in respect of stance and body positioning. The stance also aids with circumventing *some* of the known visual distortive HTR

[7] The problematic nature of teaching to apply minimum force as per related policy and legislation and other technical issues with the traditional model are elaborated in the study thesis.

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effects by keeping both eyes open and standing square onto the target to maximise the field of view. Additional skills incorporated into this system, such as scanning drills, gaze control focal points, weapons management up in front of eyes and even placement of spare magazines on the gun belt in a specific manner, all contribute to reducing the known distortive effects and poorer physiological performance.

Turning to the delivery method, the traditional model does not meaningfully reflect the operational realities of critical incidents or otherwise engage and develop participants' HTR. While the traditional model may allow some aspects of realism, for example, timed exposure of targets or ad hoc introductions of simulated stress, the absence of measured stress conditioning and adaption in an operationally simulated environment limits the model's effectiveness.

Some firearms programs, acknowledging the impact of stress, do make active attempts to introduce forms of stress by way of noise or even having personnel run before shooting. Crucially, though, these are at best *physical stresses* and not *hormonal stresses* with the accompanying activation of the HTR and associated chemical release internally. The degree of simulation in these ad hoc strategies is often inconsistent and lacks a high degree of fidelity, which is crucial in transferring theory to practice in police training environments (Shipton, 2023).

An additional fundamental flaw with the traditional model is the annual recertification, with limited training and learning occurring during this assessment process. There is a critical difference between training and qualification; training involves corrective actions and coaching, but during an assessment, this is not present (Wuestenberg, 2019). There is minimal post-recruit training and/or skills enhancement, which is best reflected by the fact that this minimum certification standard is generally the only standard to which officers are held. This approach is merely a continuation of the minimum standard established as part of PUOF culture, as opposed to an ideal learning culture of ongoing development.

The notion of training to a minimum standard within the traditional model was initially highlighted in a landmark 1970 New York Police Department (NYPD) study examining their internal firearms qualification program (McManus, 1970). Figure 1 below highlights the conclusion drawn by the NYPD that recruits reached their peak marksmanship level around 20 hours into firearms instruction and made no significant gains past this skill point but plateaued during further training and certification (ibid).

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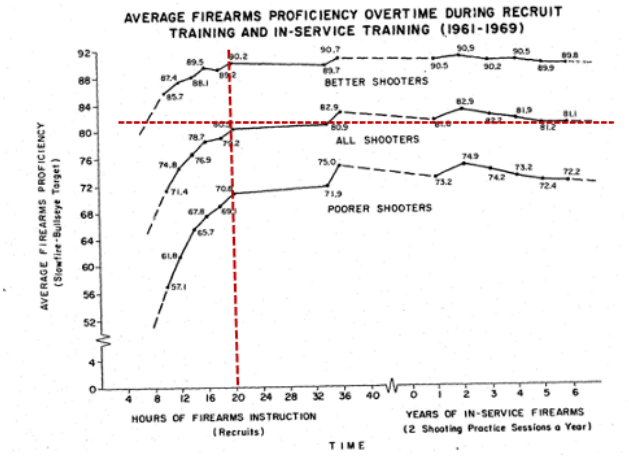

Figure 1: Adapted from the NYPD report, 1970 (McManus, p. 202).

The red dotted lines were added in Figure 1 by the author to show the point of peak marksmanship and average proficiency. These scores (shown over six years of assessment) indicate only a very modest *skills atrophy* in marksmanship, with this plateau concept becoming an early influence in a training culture oriented to achieving and sustaining *only* a minimum standard. As a result, McManus (1970) recommended reducing recruit firearms training from 56 to 40 hours. The qualification level at this time was set at 60% accuracy and the group described as the *poorer shooters* barely sustained certification levels under sterile range conditions.

It is suggested that what the NYPD actually identified is a natural skills plateau for the organisation, not a *skills ceiling*. This phenomenon, previously documented by Bryan and Harter (1899), describes *two* plateaus: the first plateau just below a working proficiency and the second plateau below *complete* [skills] *mastery*. However, skill plateaus were not well understood until sometime later when the work of Ericsson and Lehmann (1996) and Ward et al. (2007) influenced the thinking on motor skills development and skills mastery. Essentially, McManus (1970) set a false ceiling on performance, which set a mediocre expectation of adequate training and development.

STUDY AIMS AND METHOD

The working hypothesis for this study is the HTR (primarily the psychophysiological effects of acute stress), along with accompanying distortive effects, result in potential cognitive biases that may negatively influence decision-making and physiological performance during critical incidents. In this regard, HTR is a key factor in poor or sub-optimal performance in critical incidents, raising significant questions about the effectiveness of current firearm training approaches.

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This study aims to evaluate the effectiveness of the RBTI model as a firearm training model compared to the traditional firearm model in PUOF training. The two research questions for this study are:

RQ1. Is the traditional marksmanship firearm training model suitable in preparing and sustaining law enforcement personnel for critical incident encounters?

RQ2. Is the RBTI model a more effective alternative in preparing practitioners for critical incident encounters using firearms than the traditional model?

The research approach used for this study is problem-based (Ellis & Levy, 2010) and informed by the research paradigm of pragmatism. Mixed methods are used, with data collection being guided by an exploratory sequential design method (Creswell, 2006). It was originally intended to collect data from a sample of current firearm training programs for RQ1; however, due to the reluctance of police organisations to share program details, the study author had to answer RQ1 via a detailed literature review and benchmarking process of PUOF research over the past 30 years.

RQ2 is answered by examining a pilot RBTI firearm training program implemented for an unnamed organisation that historically used a traditional model. This program, designed by the lead author, is underpinned by a delivery method using contemporary and proven motor skills training methods, guided partly by operant conditioning principles and stress adaption and inoculation concepts. Quantitative data is collected from participants' physical reactions and performance at specific data points with the pilot RBTI program. Interviews with selected participants will allow for qualitative data collection to supplement quantitative data in line with the Hutter-Hennik: Qualitative Research Cycle to ensure structure and rigour to the design, collection, and analysis cycles. This study's ideal outcome is to articulate the nature of the gap between the current police training and community expectations of operational performance while proposing a viable alternative model with proven efficacy.

While intensive data collection is important for this study, it is recommended that future delivery of the RBTI should actively engage in limited data collection for ongoing student and program evaluation. This data collection will aid trainers in fine-tuning (tailoring) program delivery through identified focal points. However, the RBTI's model delivery strategy emphasises that data collection should never interfere with or detract from training delivery or compromise safety.

CONCEPTS UNDERPINNING THE RBTI: MOTOR SKILLS, STRESS, HTR AND DISTORTIVE EFFECTS

The RBTI develops firearms training beyond the traditional model through the motor skills conditioning framework premised on the work of Fitts and Posner (1967), who developed a three-

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tiered model for learning motor skills based on *cognitive*, *associative,* and *autonomous* categories. Motor skills conditioning must be considered "… within the context of occupationally relevant stress …" to ensure there is mitigation to the known impact or impairments in both physical performance and cognitive processing (decision-making) during a stressful encounter (Di Nota & Huhta, 2019, p. 9). Accordingly, the Fitts and Posner (1967) model was adapted to ensure that phased learning considered more than the fine and complex motor skills required to operate a weapon effectively *during a critical incident*. Situational awareness and decision-making, often not addressed in the traditional model, are also considered essential motor skills (ibid) and were incorporated into drills at the appropriate junctures of the RBTI, which uses the combat shooting methodology due to the effectiveness of its application under stress.

Stress is defined as an external influence on the human body and the term was first coined as the "… non-specific response of the body to any demand" (Selye, 1973, p. 692). In 1908 Yerkes and Dodson developed a theory on arousal (stress), which indicated a zone of stress where external stress aided performance. Figure 2 below represents this zone as an inverted 'u' shape.

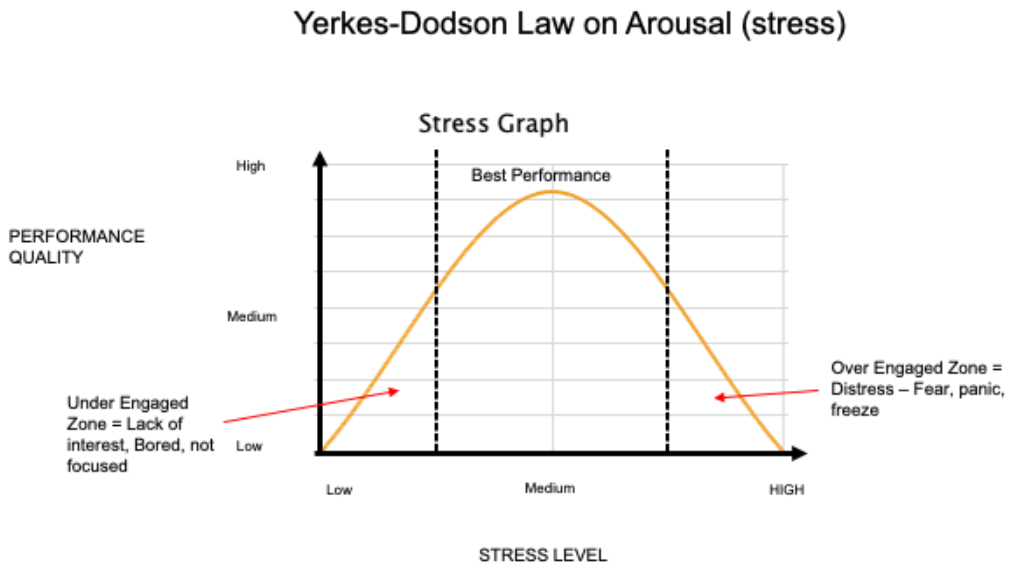

Figure 2: Yerkes-Dodson law on Arousal (stress).

The Yerkes-Dodson study concluded there was a level of under-engagement on a task and a point at which the engagement became overwhelming and performance deteriorated. There was an undefined zone of *good stress* where performance was enhanced before entering a zone of excessive stress (distress), whereby performance deteriorated, potentially due to being cognitively overwhelmed. A working assumption for this current study is that the Optimal Training Zone (OTZ), defined by Siddle and Grossman (1998), correlates with the performance zone identified by Yerkes and Dodson (1908). Initial performance results from data collected in this

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study tend to support the Siddle-Grossman OTZ – 115–145 bpm heart rate (HR) as the ideal zone for *engaged* performance.

Figure 3 below, extracted from the work of Siddle and Grossman (1998), shows the HR scale, which they concluded correlated with the hormone-induced activation. Initial results from this current study have indicated that a HR above 150 bpm starts to show the emergence of distortive effects. This zone between 145–175 bpm (indicated in red in Figure 3 has not previously been identified in any known studies related to PUOF, with this study seeking to determine whether hormonal activation has a measurable impact on performance. This area has been tentatively labelled the *partial activation zone* for this study to indicate the partial activation of the HTR and the emergence of distortive effects impacting performance.

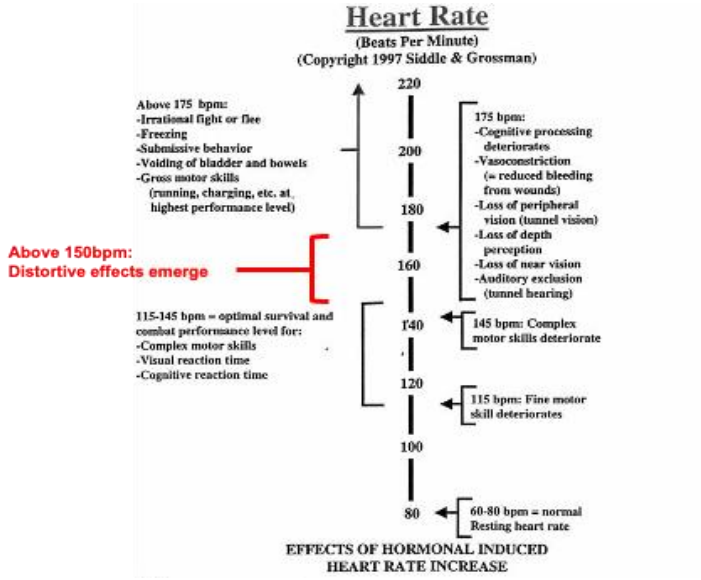

Figure 3: Representation of the psychophysiological response from the HPA Axis based on the work of Siddle and Grossman (1998).

Figure 3 also highlights two zones of significant interest besides the partial activation zone: the Optimal Training Zone (OTZ) between 115–145 bpm, within which Siddle and Grossman (1998) suggest the operator generally retains complex motor skills, visual cognition, and reactions. The second zone, above 175 bpm, suggests loss of cognition, significant deterioration of motor skills and other hormonal effects, known as *distortive effects*. This study seeks to validate the application of these theories and examine the potential of a third zone between the OTZ and full hormonal activation.

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Understanding *why* the human body responds in certain ways within these zones is important within the context of this study. The hypothalamic-pituitary-adrenocortical (HPA) axis is the primary stress response mechanism within the human brain (Dunlavey, 2018) and the neuroendocrine link between a detected stressor and a corresponding physiological reaction to the stressor (Breedlove & Watson, 2013). The HPA is activated through thalamus stimulation, acting as the brain's threat warning centre, and is activated by one of the five senses (Smith & Vale, 2006).

Once activated, the body's Automatic Nervous System (ANS), which usually prioritises the Parasympathetic Nervous System (PNS) under homeostasis as one of the two sub-systems of the ANS, sees the transfer of primacy to the other sub-system: Sympathetic Nervous System (SNS). This results in an increased heart rate and the emergence of *cognitive distortions* (Beck, 1985), inclusive of short rapid breathing, vision impairment, loss of motor skills (complex and fine), time distortion, reduced cognitive ability, audio exclusion, and a potential sense of feeling overwhelmed. All these distortions affect operational performance and potentially induce a panic response as a survival mechanism.

Additionally, these distortive effects lead to cognitive bias in terms of information processing and decision-making. Of importance is the potential for the altered perception of events and therefore potentially flawed decision-making, with the most commonly reported distortive effects from critical incidents being visual and aural distortion (Klinger & Brunson, 2009; Novy, 2012). Novy (ibid) located and examined a total of nine academic case studies on distortive effects and noted that all studies were undertaken by law enforcement psychologists. Novy (ibid) determined that up to 90% of officers involved in critical incidents would experience cognitive distortions. An officer may also believe they have perceived events which in fact did not occur or occurred significantly differently because of these distortions.

The result is significantly reduced capacity to respond to threats effectively unless appropriate physiological and psychological conditioning has been undertaken which establishes appropriate long-term applicable memories (through lived experiences) and a degree of stress inoculation that is underpinned by motor skills conditioning. This may explain the poor judgement and poor accuracy of police officers in the street, compared with high accuracy in range-based validation scores. It may also explain why effectively trained personnel (for example, those who have undertaken extensive special tactics training) can perform effectively under high stress levels.

HTR: FIGHT OR FLIGHT?

The HTR is often known as the fight or flight response, which is initiated and controlled through the brain's limbic system (colloquially known as the *reptile brain*). Fight or flight was first

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identified and named by Walter Cannon (1915) to describe resultant behaviours in humans in response to a perceived threat. The HTR categories have been expanded over recent decades to include five elements: Fight, Flight, Panic, Freeze/Fright and Posture/Faint/Fawn (Schauer & Elbert, 2010; Schmidt et al., 2008). As with any theory, there are always variations, interpretations, terminology, and challenges to names and ordering, but within this study, each of the five HTR elements is examined.

Initial results from this study indicate a potentially different ordering of subconscious preferencing to that previously suggested: Fight, Panic (Fright), Flight, Freeze, and Posture (fawn/faint). In the current study, students were subjected to a micro scenario (lasting less than 10 seconds) on day one of the transitional RBTI program to assess individual natural tendencies towards HTR under acute stress, with a view to measuring HTR responses on two further occasions in the program. These results provide data points to evaluate participants' progress and adaption.

There is no established research to indicate a natural inclination to choose fight as the primary response to a perceived threat. The issue of conditioned responses examined by Gray and McNaughton (2003) was applied in this study. Early results have shown the potential to influence an improved *fight* response and to significantly influence the reduction in the *panic* response within the RBTI; however, final results will be required to confirm this. The motor skills acquisition elements of the RBTI program were specifically designed not just to develop an effective physical response and functionality under extreme stress but to influence the subconscious brain to choose fight at the time of HTR activation, which is a conditioned response.

Importantly, the term *fight* for this research is not applied in the literal sense, indicating only the application of violence. Instead, the term is applied in the sense of conditioning the brain to take *positive affirmative action* in the presence of acute stress and demonstrate the ability to make sound and ethical decisions; essentially, the self-awareness, control, and ability to apply an effective, appropriate, and reasonable response. The term *resilience* has no universally accepted definition (Sisto, 2019, p.1) and for this research will be interpreted as the ability of the human mind/body to absorb, perform and recover from the impact of stress (both chronic and acute), which generally aligns with the conclusions and proposed definition of Sisto (ibid).

INITIAL STUDY RESULTS RELATING TO DISTORTIVE EFFECTS

This brief outline of selected study results focuses on distortive effects and other HTR data. The value of understanding distortive effects within the current study is important in determining if simulated scenarios could reliably reproduce conditions of distortive effects in a live critical incident, informing the RBTI stress conditioning process. Initial results outlined in Figure 4 below indicate the ability of correctly constructed and managed scenarios to safely recreate the

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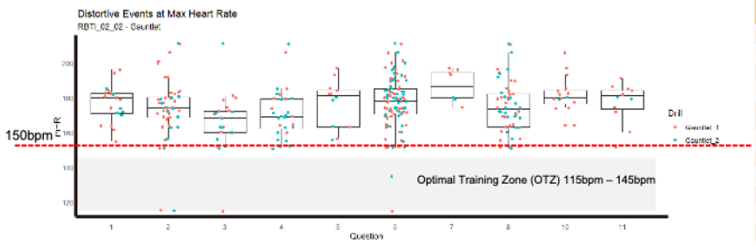
distortive effects noted in previous operational post-incident reviews, both in number experienced and primacy of ordering.

ANALYSIS			Of only those affected to what extent (as a %)				
Mini Survey question on distortion & perception effects	Total affected	Total affected as a % of total course	Mild	Moderate	Significant	Severe	Extreme
Difficulty Changing magazines?	7	41.18%	57.14%	28.57%	0.00%	14.29%	0.00%
Tunnel Vision?	7	41.18%	71.43%	14.29%	14.29%	0.00%	0.00%
Focus on a particular sound?	3	17.65%	10.00%	10.00%	0.00%	0.00%	0.00%
Did sounds seem louder or quieter?	3	17.65%	0.00%	66.67%	0.00%	0%	33.33%
Lose any situational awareness (SA)?	2	11.76%	100.00%	0.00%	0.00%	0.00%	0.00%
Trouble breathing or controlling breathing?	15	88.24%	0.00%	20.00%	33.33%	13.33%	33.33%
Shaky hands	3	17.65%	66.67%	33.33%	0.00%	0.00%	0.00%
Did time seem to speed up or slow down?	9	52.94%	0.00%	55.56%	44.44%	0.00%	0.00%
Any memory loss?	5	29.41%	20.00%	40.00%	20.00%	20.00%	0.00%
Did you feel overwhelmed or not in control?	1	5.88%	0.00%	0.00%	100.00%	0.00%	0.00%
							N = 55

Figure 4: Results from initial distortive effects monitoring during the RBTI transition program.

It was further determined that distortive effects began to emerge just slightly above the Optimal Training Zone (OTZ) of 115–145 bpm, as defined by Siddle and Grossman (1998) at around 150 bpm. This observed result to date supports Siddle and Grossman's theory of an optimal performance zone and may prove useful in aiding trainers with training structure and delivery.

Figure 5 below is a plot graph demonstrating the spread of HTR data recorded during a structured drill compared with the results of the distortive effects gathered through an immediate mini-survey post-drill.



No.	Distortive Effect
1	Loss of motor skills (ie. Difficulty changing magazines)
2	Tunnel Vision
3	Focus on sound
4	Sound seems louder or lower
5	Loss of situational awareness
6	Breathing control (short/ shallow breathing)
7	Shaky hands
8	Time speed up or slow down
9	Perceived length of drill (benchmark of time awareness)
10	Memory loss
11	Sense of feeling overwhelmed

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Figure 5: Comparison of HTR and distortive effects.

Figure 6 below shows measured reactions based on observations during a structured *micro scenario*. The participants were all serving personnel and their initial assessment was undertaken on day one of the RBTI program.

HTR	Initial Assessment (N= 98)	2nd Assessment (N= 85)	Comment
Fight	48%	73%	
Flight	11%	4%	
Freeze	6%	6%	Steady
Panic	32%	14%	
Posture	2%	2%	Steady

Figure 6: Measured reactions during a structured micro scenario.

The second assessment was undertaken on day one of the third module (day 21) of the RBTI transition program. The micro scenarios are always initiated with a traumatic event designed to stimulate one of the body's sensors (Gray & McNaughton, 2003) to initiate the HPA. These results indicate the ability to influence HTR and may speak to stress adaption and/or environmental conditioning leading to resilience. All micro scenarios are tailored to include shoot/no shoot decision points and layered threats requiring a priority-based response (e.g., one role player with a gun and another with a knife).

DISCUSSION

Evaluation of the RBTI used several of the longest-standing primary stress theories (Cannon, 1915; Selye [General Adaptive Syndrome] 1950; Yerkes-Dodson, 1908) against which to evaluate performance under stress and validate adaption under stress. Additionally, the theoretical work by Siddle and Grossman (1998) related to the effects of hormonally induced stress on operational performance and the case study-based works by Artwhol (2002), Klinger (2001), and Novy (2012) on stress-related distortive effects of HTR are used to guide and measure this study.

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These established theories and case study results guide the validation of observed effects of hormonal stress and replicate the responses within the RBTI context. Such validation in a training environment can allow reliable construction of a realistic training environment that replicates the same psychophysiological effects documented in critical incidents. These training effects are measurable, observable, and endorsed through participant feedback regarding the event's lived experience subjectively (Cahour et al., 2016).

The training performance phenomena evaluated during the pilot program may validate the long-held stress theories mentioned. Additionally, there is potential to build on some of these theories, particularly the impact of complex motor skills influenced by the Yerkes-Dodson inverted 'u-stress' curve theory. Further, a better understanding of the cognitive distortions under stress in an operational context may emerge, including the ability to replicate the established distortive effects in a training environment consistent with ordering and primacy from historical research.

Most significantly, analysis of the collected data from specific measured drills with the RBTI transitional program indicates the potential for probabilistic predictions on the likelihood of an officer choosing to *fight* in a critical incident based upon their conditioning and linked to their HTR, as an indicator of perceived stress. Evaluation of the RBTI includes the developing phenomenon of *partial activation* of the reptile brain to describe emerging behaviours under chronic stress and resulting distortive effects, which have been reliably observed in more than 100 drills where participant pulse rates were elevated above 150 bpm. Previously, Siddle and Grossman's (1998) work on hormonally-induced stress had considered a heart rate of 175 bpm as the activation level of the full response.

There is also potential in the ordering or prevalence of the five HTR modes and the ability to influence the subconscious selection of these phenomena when a threat is presented within a training program. Initial analysis of the study data indicated the potential to influence subconscious reaction to stress, accompanied by improved psychophysiological functionality. Initial testing of the HTR, as the entry point to the RBTI program, indicated that less than 50% of participants[8], with an average number of 12 years of service, demonstrated a *fight* response, with the second most prevalent response being *panic* at 32%. By the third module of the RBTI program, this number had risen to almost 75% choosing *fight* and the panic response had decreased to 14% across participants in the program (N= 85). The results from the third data point will allow for conclusions.

The potential to apply the RBTI methodology to existing simulator training environments is possible. However, the engagement of multiple senses is required to achieve full effectiveness

[8] It should be noted that these participants were serving personnel, some who had been involved in critical incidents. It is probable the fight response would have been considerably lower if the assessment was undertaken with police academy recruits.

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and a fully immersive experience. The use of simulators provides the trainee with a partial experience due to the nature and functionality of the human visual system – cortical processing: object recognition is addressed in the ventral cortical visual pathway and spatial recognition is addressed in the dorsal visual cortical visual pathway (Mishkin et al., 1983). More research is required but the effectiveness of simulators may be limited due to the limitations presented in dorsal visual cortical processing (spatial cognition). This discussion exceeds the limits of both this paper and the current research.

RBTI – A NEW FUTURE IN PUOF TRAINING?

Reality-Based Training (RBT) is defined as,

> "... a comprehensive description of many different training methodologies that utilize tools, techniques, technologies or methodologies to approximate in a training setting or synthetic setting any situation that might occur in an operational setting ..." (Murray, n.d.)

RBT is an experiential learning method, which is, "... the process by which knowledge is created through the transformation of personal experience" (Kolb, 1984. p. 38). The RBTI program, incorporating this foundational RBT principle, is designed to promote encouragement and opportunity in learning and develop self-confidence and decision-making while engaging student emotion and encouraging a process of self-reflection on the lived experience of learning. Essentially, this style of knowledge and skill transfer to practice challenges more traditional or *passive* modes of learning, encouraging the development of critical thinking and decision-making (Zapalska & Brozik, 2020). This concept also applies to the relatively passive aspects of current firearm training that fail to replicate real-world experiences and inhibit real-world transfer of the limited skills policing students learn in the traditional model.

The RBTI model is tailored to assist organisations in transitioning from the traditional model to an authentic approach inspired by combat model techniques and augmented by scientific feedback. The program design emphasises developing observable motor skills based on establishing strong neuromuscular pathways (Riemann & Lephart, 2002). Accompanying this motor skills element is a graduated introduction to both chronic and acute stress to enhance participants' physiological and psychological reactions, making them familiar with and prepared for their emotional and physical reactions to critical incidents.

Any transition to the RBTI model is not simply the introduction of more scenarios, stress, or a new style of shooting but a focus on developing resilience through self-confidence and self-efficacy in a structured learning framework. This enhanced and informed view of *self* is designed to generate an awareness of one's capability and limitations. Crucially, enhancing capability and self-efficacy allows greater scope for critical thinking and decision-making under extreme stress. These changes to PUOF training go beyond modifications in content and method to include a

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learner-centred and evidence-based training culture. This change moves beyond a minimum standard mindset and encourages police to continuously develop and evolve their skills to effectively engage with and prevail in critical incidents.

CONCLUSION

While the traditional model provides a minimum marksmanship standard which has been legally defensible to this point, it is not a justification for steadfastly adhering to it. Likewise, waiting for a catastrophic event of such magnitude that change is forced upon law enforcement is also not the answer. Current firearm training practices must be flexible and progressive to evolve and adapt in line with community expectations, technological advances, the ever-evolving academic and scientific studies on understanding human performance, and, importantly, changing threat environments.

Research based on direct evidence and subject-based support from within law enforcement highlights that police applications of lethal force in critical incidents are often sub-optimal. This is not a criticism of the men and women who carry a badge and protect communities. It is, however, a direct criticism of law enforcement managers and legislators who have doggedly clung to an outdated and unsuitable training model, along with unclear supporting legislation, policy, and use of force continuums. The cost of change and time invested in training are never acceptable excuses for not embracing change in the face of logic and evidence. Education is expensive, ignorance more so (Shipton, 2023).

The initial study results highlighted in this paper show promise within the RBTI model in adapting and operationalising some key stress theories to firearms training so that participants' ability to recognise and adapt to operational stress within critical incidents can be enhanced. While the RBTI is not the first program to be labelled reality-based or use scenarios, it is innovative in using scientific feedback, as part of a continuing feedback loop, to inform the use of these stress theories and develop and monitor participants' stress adaption. Finally, it is envisaged that techniques for stress adaption developed in this study can be used to enhance other forms of PUOF training and provide a lasting level of emotional resilience for police recruits.

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REFERENCES

ANZPAA. (2013). *ANZPAA Use of Force Principles*. Melbourne, Australia. Retrieved from https://www.anzpaa.org.au/publications/general

Akinola, M., & Mendes, W. B. (2012). Stress-induced cortisol facilitates threat-related decision making among police officers. *Behavioral neuroscience, 126*(1), 167–174. doi:10.1037/a0026657.

Alpert, G. P. (1989). Police use of deadly force: The Miami experience. *Critical issues in policing*, 480-496.Alpert, G. P., Dunham, R. G., & Police Executive Research Forum. (1997). *The force factor: measuring police use of force relative to suspect resistance*. Washington, D.C.: Police Executive Research Forum.

Artwohl, A. (2002). Perceptual and memory distortion during officer-involved shootings. *FBI Law Enforcement Bulletin, 71*(10), 18–24.

Aveni, T. J. (2003). Officer Involved Shootings: What we didn't know has hurt us. *The Police Policy Studies Council*. Retrieved from https://www.hptinstitute.com/wp-content/uploads/2014/01/Officer-Involved-Shootings-What-We-Didnt-Know.pdf

Baldwin, S., Bennell, C., Blaskovits, B., Brown, A., Jenkins, B., Lawrence, C., & Andersen, J. P. (2022). A Reasonable Officer: Examining the Relationships Among Stress, Training, and Performance in a Highly Realistic Lethal Force Scenario. *Frontiers in Psychology, 12*, 759132. doi:10.3389/fpsyg.2021.759132

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. doi:10.1037/0033-295X.84.2.191

Beck, A. T. (1985). Theoretical perspectives on clinical anxiety. In T. Maser (Ed.), *Anxiety and the anxiety disorders*. (pp. 183–196). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Benton, F. (2018). *Within Reason: An Analysis of Department Use of Force Policies in Most-Populated U.S. Cities*.

Blascovich, J., & Tomaka, J. (1996). The Biopsychosocial Model of Arousal Regulation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 1–51): Academic Press.

Breedlove, S. M., & Watson, N. V. (2013). *Biological psychology: an introduction to behavioral, cognitive, and clinical neuroscience* (7th ed.). Sunderland, Massachusetts: Sinauer Associates, Inc., Publishers.

Bryan, W. L., & Harter, N. (1899). Studies on the telegraphic language: The acquisition of a hierarchy of habits. *Psychological Review, 6*(4), 345–375. doi:10.1037/h0073117

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Cahour, B., Salembier, P., & Zouinar, M. (2016). Analyzing lived experience of activity. *Le travail humain, 79*(3), 259–284. doi:10.3917/th.793.0259

Cannon, W. B. (1915). *Bodily changes in pain, hunger, fear and rage: An account of recent researches into the function of emotional excitement*. New York, NY, US: D Appleton & Company.

Cojean, S., Combalbert, N., & Taillandier-Schmitt, A. (2020). Psychological and sociological factors influencing police officers' decisions to use force: A systematic literature review. *International Journal of Law and Psychiatry, 70*, 101569–101569. doi:10.1016/j.ijlp.2020.101569

Cole, J. N. (2020). *There Are Always Two Sides to Policy: Police Use of Deadly Force*. ProQuest Dissertations Publishing.

Creswell, J. D. (2006). *Qualitative Inquiry and Research Design*: SAGE Publications.

Davis, W., Langton. (2018). Contacts Between Police and the Public, 2015. *US Department of Justice: Office of Justice Programs*.

Di Nota, P. M., & Huhta, J. M. (2019). Complex Motor Learning and Police Training: Applied, Cognitive, and Clinical Perspectives. *Front Psychol, 10*, 1797. doi:10.3389/fpsyg.2019.01797

DOJ. (2015). *Final Report of the President's Task Force on 21st Century Policing*. (NCJ Number: 248928). USA: Office of Justice Programs.

DOJ. (2019). *Law Enforcement Officers Killed & Assaulted - LEOKA - 2019*. USA: Criminal Justice Information Services Division.

Donner, C. M., & Popovich, N. (2018). Hitting (or missing) the mark: An examination of police shooting accuracy in officer-involved shooting incidents. [Hitting (or missing) the mark]. *Policing, 42*(3), 474–489. doi:http://dx.doi.org/10.1108/PIJPSM-05-2018-0060

Dunlavey, C. J. (2018). Introduction to the Hypothalamic-Pituitary-Adrenal Axis: Healthy and Dysregulated Stress Responses, Developmental Stress and Neurodegeneration. *Journal of Undergraduate Neuroscience Education, 16*(2), R59–R60.

Engel, R. S., McManus, H. D., & Herold, T. D. (2020). Does de-escalation training work?: A systematic review and call for evidence in police use-of-force reform. *Criminology & Public Policy, 19*(3), 721–759. doi:10.1111/1745-9133.12467

Ellis, T., & Levy, Y. (2010). *A Guide for Novice Researchers: Design and Development Research Methods*.

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Ericsson, K. A., & Lehmann, A. C. (1996). Expert and exceptional performance: Evidence and maximal adaptation to task constraints. *Annual Review of Psychology, 47*(1), 273. doi:10.1146/annurev.psych.47.1.273

Fitts, P. M., & Posner, M. I. (1967). *Human performance*. Belmont, Calif: Brooks/Cole.

Fyfe, J. J. (1978). *Shots Fired: An Examination Of New York City Police Firearms Discharges*. Doctoral thesis: State University of New York at Albany.

Fyfe, J. J. (1988). Police use of deadly force: Research and reform. *Justice Quarterly, 5*(2), 165–205. doi:10.1080/07418828800089691

Geller, W. A., & Scott, M. (1992). *Deadly Force: What We Know; A Practitioner's Desk Reference on Police-Involved Shootings*. United States: Police Executive Research Forum (PERF).

Geller, W. A., & Karales, Kevin J. (1982). Shootings of and by Chicago Police: Uncommon Crises--Part II: Shootings of Police, Shooting Correlates and Control Strategies. *The Journal of Criminal Law and Criminology, 73*, 49.

Gillespie, D. C. (2012). *Deadly Force Statistical Analysis 2010–2011 Las Vegas Metropolitan Police Department*. Retrieved from https://cops.usdoj.gov/pdf/deadly-force-statistical-analysis.pdf

Goldsworthy, T. (2021). Australia had a record number of police shootings in the past year. Should we be concerned? *The Conversation*.

Gray, T. J. A., & McNaughton, N. (2003). *The Neuropsychology of Anxiety: An enquiry into the function of the septo-hippocampal system*: OUP Oxford.

Guillaume, Y. (2010). *Close Quarters Combat Shooting*. (Master of Military Studies Research Paper). United States Marine Corps Command and Staff College, Quantico, Virginia, USA.

Hine, K. A., & BPsychSc, B. C. C. J. (2017). Understanding Police Use of Force Encounters in Context: What Encounters Look Like, Circumstances when Officers get Injured, and the Decision Factors and Processes Involved. PhD thesis: Griffith University.

Hine, K. A., Porter, L. E., Westera, N. J., Alpert, G. P., & Allen, A. (2018). Exploring Police Use of Force Decision-Making Processes and Impairments Using a Naturalistic Decision-Making Approach. *Criminal Justice and Behavior, 45*(11), 1782–1801. doi:10.1177/0093854818789726

IACP. (2001). *Police use of force in America*. Retrieved from https://www.theiacp.org/sites/default/files/2018-08/2001useofforce.pdf

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Jackman, T. (2021). For a second year, most U.S. police departments decline to share information on their use of force. *Washington Post*.

Johnson, P., & Johnson, A. (2023). *Review of NSW Police Force Use of Force Reporting*. Law Enforcement Conduct Commission Retrieved from https://www.opengov.nsw.gov.au/publications/20301.

Kelley, D. C., Siegel, E., & Wormwood, J. B. (2019). Understanding Police Performance Under Stress: Insights From the Biopsychosocial Model of Challenge and Threat. *Front Psychol, 10*, 1800. doi:10.3389/fpsyg.2019.01800

Klinger, D. (2001). *POLICE RESPONSES TO OFFICER-INVOLVED SHOOTINGS*. USA: Office of Justice Programs.

Klinger, D. (2012). *Into the kill zone: A cop's eye view of deadly force*: John Wiley & Sons.

Klinger, D. A., & Brunson, R. K. (2009). Police officers' perceptual distortions during lethal force situations: Informing the reasonableness standard. *Criminology & Public Policy, 8*(1), 117–140. doi:10.1111/j.1745-9133.2009.00537.x

Kolb, D. A. (1984). *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Landman, A., Nieuwenhuys, A., & Oudejans, R. R. D. (2016). Decision-related action orientation predicts police officers' shooting performance under pressure. *Anxiety, Stress, & Coping, 29*(5), 570–579. doi:10.1080/10615806.2015.1070834

Lersch, K. M., & Mieczkowski, T. (2004). *Violent Police Behavior: Past, Present, and Future research directions*. *Aggression and Violent Behavior, 10*(5), 552–568. doi:10.1016/j.avb.2004.10.002

Lewinski, W. J., Avery, R., Dysterheft, J., Dicks, N. D., & Bushey, J. (2015). The real risks during deadly police shootouts: Accuracy of the naïve shooter. *International Journal of Police Science & Management, 17*(2), 117–127. doi:10.1177/1461355715582975

McManus, G. P. (1970). *Police Training and Performance Study*. USA: U.S. Government Printing Office. Retrieved from https://eric.ed.gov/?id=ED056204

Milton, C. H., Halleck, J. W., Lardner, J., & Abrecht, G. (1977). Police use of deadly force. USA: US DOJ.

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Mishkin, M., Ungerleider, L. G., & Macko, K. A. (1983). Object vision and spatial vision: two cortical pathways. *Trends in Neurosciences, 6*, 414–417. Doi:https://doi.org/10.1016/0166-2236(83)90190-X

Morrison, G., & Vila, B. (1998). Police handgun qualification: Practical measure or aimless activity? *Policing An International Journal of Police Strategies and Management, 21*, 510–533. doi:10.1108/13639519810228804

Morrison, G. B. (2006). Deadly Force Programs Among Larger U.S. Police Departments. *Police Quarterly, 9*(3), 331–360. doi:10.1177/1098611105276542

Murray, K. (n.d). Reality Based Training Association. Retrieved from https://www.rbta.net/

Naghavi, M. (2021). Fatal police violence by race and state in the USA, 1980–2019: a network meta-regression. *The Lancet, 398*(10307), 1239–1255. doi:10.1016/S0140-6736(21)01609-3

Novy, M. (2012). Cognitive Distortions During Law Enforcement Shooting. *Activitas Nervosa Superior, 54*, 60–66. doi:10.1007/BF03379584

Oramas Mora, D., Terrill, W., & Foster, J. (2023). A Decade of Police Use of Deadly Force Research (2011–2020). *Homicide Studies, 27*(1), 6–33. doi:10.1177/10887679221123591

Reaves, B. A. (2016). *State and Local Law Enforcement Training Academies, 2013*.

Riemann, B. L., & Lephart, S. M. (2002). The sensorimotor system, part I: the physiologic basis of functional joint stability. *Journal of Athletic Training, 37*(1), 71–79.

Rudovsky, D. (2017). The Troubling Issues Regarding Police Use of Force. *The Regulatory Review,* 5.

Ryan, E. J. (2012). Below the belt: police use of conducted energy weapons in Australia. PhD thesis: Monash University

Scharf, P., & Binder, A. (1983). *The badge and the bullet: Police use of deadly force* (p. 23) New York: Praeger.

Schauer, M., & Elbert, T. (2010). Dissociation following traumatic stress: Etiology and treatment. *Zeitschrift für Psychologie/Journal of Psychology, 218*(2), 109–127. doi:10.1027/0044-3409/a000018

Schmidt, N. B., Richey, A. J., Zvolensky, M. J., & Maner, J. K. (2008). Exploring Human Freeze Responses to a Threat Stressor. *National Institute of Health, 39*, 292–304.

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Selye, H. (1950). Stress and the General Adaptation Syndrome. *BMJ, 1*(4667), 1383–1392. doi:10.1136/bmj.1.4667.1383

Selye, H. (1973). The Evolution of the Stress Concept: The originator of the concept traces its development from the discovery in 1936 of the alarm reaction to modern therapeutic applications of syntoxic and catatoxic hormones. *American Scientist, 61*(6), 692–699. Retrieved from http://www.jstor.org/stable/27844072

Service, N. C. J. R., & Programs, U. S. O. o. J. (1998). *NCJRS Catalog: Publications and Services of the Office of Justice Programs Agencies*: U.S. Department of Justice, Office of Justice Programs.

Shipton, B. (2023). What is Problematic with Police Education? In B. Shipton (Ed.), *Signature Pedagogies in Police Education: Teaching Recruits to Think, Perform and Act with Integrity* (pp. 25–38). Springer Nature Switzerland.

Siddle, B., K., & Grossman, D. (1998). Effects of Hormonal Induced Heart Rate Increase. *The Post-Traumatic Gazette, 4*.

Sisto, A., Vicinanza, F., Campanozzi, L. L., Ricci, G., Tartaglini, D., & Tambone, V. (2019). Towards a Transversal Definition of Psychological Resilience: A Literature Review. *Medicina (Kaunas), 55*(11). doi:10.3390/medicina55110745

Smith, S. M., & Vale, W. W. (2006). The role of the hypothalamic-pituitary-adrenal axis in neuroendocrine responses to stress. *Dialogues Clin Neurosci, 8*(4), 383–395. doi:10.31887/DCNS.2006.8.4/ssmith

Stafford, M. D. (2019). *Influence of Police Officer Fear and Use-of-force Outcomes*. ProQuest Dissertations Publishing.

Staller, M. S., Koerner, S., Heil, V., Klemmer, I., Abraham, A., & Poolton, J. (2022). The Structure and Delivery of Police Use of Force Training: A German Case Study. *European Journal for Security Research, 7*(1), 87–112.

Thomasson, J. (2013). An analysis of firearms training performance among active law enforcement officers. In: ProQuest Dissertations Publishing.

United Kingdom Statutory Instruments on The Criminal Justice and Immigration Act 2008 (Commencement No. 7) Order 2009: 1. (2008). *US Fed News Service, Including US State News*.

Washington Post (2024) Updated police shooting database. Retrieved from https://www.washingtonpost.com/graphics/investigations/police-shootings-database/

Volume 12, Issue 1, 2024
ISSN: 2202-5677

Ward, P., Hodges, N., Starkes, J., & Williams, M. (2007). The road to excellence: Deliberate practice and the development of expertise. *High Ability Studies - HIGH ABIL STUD, 18*, 119–153. doi:10.1080/13598130701709715

Werth, E. P. (2009). *Problem-Based Learning in police academies: Adult learning principles utilized by police trainers*. (Ed.D.). Liberty University, United States – Virginia.

Westmoreland, H. (1989). The Selection of a Shooting Stance Under Stress. *Law and Order Journal, 37*(10), 13.

White, M. D. (2006). Hitting the Target (or Not): Comparing Characteristics of Fatal, Injurious, and Noninjurious Police Shootings. *Police Quarterly, 9*, 303–330.

Wortley, S., Owusu-Bempah, A., Laming, E., & Henry, C. (2021). *Police use of force in Canada: A review of data, expert opinion, and the international research literature*. Retrieved from https://www.ccja-acjp.ca

Wuestenberg, J. (2019). Firearms qualifications are NOT important! Police1, Lexipol Media Group. https://www.police1.com/police-products/firearms/articles/firearms-qualifications-are-not-important-63vJQwojkkXcgH2s/

Yerkes, R. M., & Dodson, J. D. (1908). The Relation of Strength of Stimulus to Rapidity of Habit Formation. *Journal of Comparative Neurology & Psychology, 18*, 459–482. doi:10.1002/cne.920180503

Zapalska, A. M., & Brozik, D. (2020). The Effectiveness of Experiential Learning in a Large Classroom: An Example of the Auction Market. *International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), 11*(2), 12.

Zillman, S. (2023). Data shows Queensland Police shot more people last year than police in the rest of Australia combined. https://www.abc.net.au/news/2023-08-04/queensland-police-shootings-730/102686276