Chapter Title: Expertise in Law Enforcement

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Introduction

Law enforcement is a profession that encompasses many specialties. Over their careers, officers may acquire skill in one or more roles, including undercover work, human trafficking, patrol, sex crime, cybercrime, tactical operations (e.g., special weapons and tactics or SWAT), investigation (e.g., forensic, homicide, theft), hostage negotiation, counterterrorism, canine operations, crisis intervention, instructor (e.g., firearm, defensive tactics, use of force), missing persons, and surveillance. But compared to others domains in which expertise can be readily defined and objectively measured (e.g., chess), there is no universally accepted way to describe or measure expertise in law enforcement.

Our aim in this chapter is to provide an overview of expertise research in law enforcement and guidance for those planning on conducting research themselves. We begin by describing conceptualizations of expertise in law enforcement, and offer a working definition. We then identify challenges facing researchers interested in conducting expertise research in law enforcement, and advise how to overcome those challenges. Next, we provide concrete examples of how research in this domain has been conducted. In doing so, we cover a broad range of methods and highlight the subtleties that researchers new to the domain should consider when designing and conducting expertise research. Following that, we describe key insights from the literature that cover the spectrum of expertise in law enforcement. Notably, the review provides an international

perspective of this topic, presenting findings from research conducted around the world. Finally, we suggest directions for future research.

Conceptualizations of expertise in law enforcement

The extent to which policing, in general, is a craft versus a science has been widely debated in the policing and criminal justice literature (e.g., Bayley & Bittner, 1984; Willis & Mastrofski, 2014). Those who view policing strictly as a craft assume that officers learn largely through experience on the job; formal education and training have little perceived value. Wilson (1968) encapsulates this perspective:

> The patrolman is neither a bureaucrat nor a professional, but a member of a *craft*. As with most crafts, his has no body of generalized, written knowledge nor a set of detailed prescriptions as to how to behave—it has, in short, neither theory nor rules. Learning in the craft is by apprenticeship, but on the job and not in the academy. . . . And the members of the craft, conscious of having a special skill or task, think of themselves as set apart from society, possessors of an art that can be learned only by experience, and in need of restrictions on entry into their occupation. But unlike other members of a craft—carpenters, for example, or newspaperman—the police work in an apprehensive or hostile environment producing a service the value of which is not easily judged.

(p. 283)

On the other hand, there has been a long push to toward

professionalization of policing. This includes the requirement for formalized basic

training at a police academy and academic qualifications (College of Policing,

2016; Marshall, 2015). The very existence of field training programs, during

which a rookie officer accompanies and is mentored by an experienced officer, is

an acknowledgment that academy training alone is not sufficient for officers to

work independently.

The judicial system often presumes that trained police officers possess

expertise, but critics have questioned the basis for this presumption, citing a lack

of evidence (Lvovsky, 2016). Traditionally, police have been assumed to possess

special expertise that they developed through their work, which civilians cannot

understand (Bayley, 2016). Bayley notes, however, that many of the public are

now questioning such assumptions, and are seeking proof that such special

expertise exists. In the United States, police actions continue to be scrutinized due

to high-profile incidents, such as the shooting of unarmed black men. In legal

circles, there has been much debate about the validity of police officers'

intuitions, hunches, and gut instincts (e.g., as a basis for forming suspicions about

who to stop and frisk), and whether these abilities—if they indeed exist—

constitute expertise (Alschuler, 2007; Fulford, 2011; Segal, 2012; Taslitz, 2010;

Worrall, 2013). There is often no evidence or rational basis provided in support of

these intuitions, but they are the lingua franca of law enforcement.

In 2004 the US National Institute of Justice, Federal Bureau of Investigation, and American Psychological Association held a workshop with researchers, psychologists, and police experts from around the world to examine the nature and influence of intuition in law enforcement. The report on the workshop noted the lack of consensus over how to define intuition, with comparisons made to 'complex pattern recognition,' 'complex emergent processes,' the 'sense of dread' that came with some police calls and not others, and the 'hairs standing up on the back of your neck' (American Psychological Association, 2004, p. 3). Although the workshop identified pertinent research questions related to intuition, to the best of our knowledge no police-related intuition research was specifically funded or published. More recently, however, the role of intuition in law enforcement has been examined in the UK in comparison to more analytical modes of thinking (Akinci & Sadler-Smith, 2013).

Among police officers themselves, experts have been referred to as the '5 percenters' (Force Science News, 2006), and their close cousins, the '10 percenters' (Savelli, 2010). These are essentially officers in the right-hand tail of a hypothetical performance distribution: those who are known or perceived to be better than most officers. This conceptualization of expertise normally addresses street smarts, tactical proficiency, and a warrior mindset. Force Science News (2006) describes some of the characteristics of 5 percenters, which include the

ability to detect subtle, but important, cues and the ability to quickly select the appropriate level of force needed to resolve a situation.

Measuring police performance and expertise, however, has been problematic. In law enforcement, performance is often evaluated via appraisals (e.g., supervisor and peer ratings of performance; Love, 1983). These evaluations typically focus on broader measures of performance (e.g., number of arrests) rather than on skill evaluation (e.g., Shane, 2010). They have also been criticized as being ritualistic and meaningless (Manning, 2008).

In response to these criticisms, more principled approaches have been suggested. For example, situational judgment tests have been used to elicit tacit knowledge and identify expertise (Taylor et al., 2013). In the field of forensics, expertise has been conceptualized as a forensic examiner's reliability and biasability (Dror, 2016). In the realm of use-of-force situations, researchers have taken steps to develop metrics for performance (Vila, 2014; see also Wollert, 2008). Nonetheless, assessing performance and measuring expertise is difficult because even experts may not agree about what constitutes criterion performance.

A working definition

These different conceptualizations of expertise in law enforcement suggest that it is indeed a difficult concept to define. In light of this, we offer a working definition: Expertise in law enforcement is characterized by the ability to adaptively apply one's skills, knowledge, and attributes to novel and complex

(e.g., uncertain, time-pressured, dangerous) situations and environments. We hope that this definition, which draws on notions of cognitive readiness, adaptive expertise, and accelerated expertise (Ericsson, 2014; Hoffman, Ward, Feltovich, DiBello, Fiore, & Andrews, 2014), is useful to expertise researchers and those responsible for training law enforcement officers.

Challenges to conducting expertise research in law enforcement

There are many challenges facing researchers interested in conducting expertise research in law enforcement. These challenges range from those generally encountered by researchers wishing to conduct research in applied settings to those that are specific to the domain of law enforcement. In this section, we describe some of the challenges and suggest ways to overcome them (see Table 1).

Insert Table 1 about here

The cultural divide between police and researchers

Although expertise researchers may be enthusiastic about conducting research in law enforcement, police leaders and operational personnel may be less enthusiastic about collaborating with researchers (e.g., Cockbain & Knutsson, 2014; Cordner & White, 2010; Fyfe & Wilson, 2012; Murji, 2010; Rojek, Martin,

& Alpert, 2014). For example, law enforcement agencies may be concerned that researchers will be critical and try to portray police in a negative light (e.g., racially biased, prone to aggression). A related issue stems from the perspective of legal liability: If research reveals that current training is substandard, the agency may feel compelled to change policy, procedure, and/or practice, regardless of whether it has the resources and motivation to do so. As described in Table 1, there are several things that researchers can do to overcome these barriers. In our experience, the most helpful is to demonstrate an understanding of the challenges faced by police in their daily work, and to spend time getting to know police. In the USA, many law enforcement agencies conduct regular citizen police academies, which aim to educate the public about police work and improve police-community relations (Lee, 2016). Participating in a citizen police academy is a good way for researchers to become more familiar with law enforcement and meet officers who can facilitate research collaboration. Researchers should also be prepared to tout the benefits of law enforcement-academic collaborations, which include bringing novel perspectives and ideas, as well as improved policies and procedures (Burkhardt et al., 2017; Guillaume, Sidebottom, & Tilley, 2012; Hansen, Alpert, & Rojek, 2014).

"Oh no, not the psychologists!"

The academic foundation for many expertise researchers is the field of psychology. When meeting others, it is common for expertise researchers to

describe themselves as 'psychologists' or 'psychological researchers.' Even if researchers refer to themselves using different terms, other cues may point toward an affiliation with psychology (e.g., academic department name on business cards and email signatures). Police officers generally distrust academics, among other groups in society (Van Maanen, 1978) and are wary of psychologists in particular (Max, 2000; White & Honig, 1995).

From the perspective of police, 'psychology' is most commonly associated with clinical or forensic psychology. That is, police may be unaware of the breadth of psychology as a field of study; they may not be familiar with expertise research, (applied) cognitive psychology, human factors, cognitive engineering, and naturalistic decision making. In light of this, we suggest that expertise researchers explain—during their initial contact with law enforcement agencies—what their general intent is (e.g., "I am interested in understanding what makes your top performers so good. How do they see situations differently than other officers?"). We have also found it helpful to state, explicitly, that we are *not* clinical psychologists. An additional piece of advice is to leverage police officers' familiarity with existing, accessible police research. For example, in the United States many police trainers are familiar with the work of the Force Science Institute (www.forcescience.org)—a research, consulting, and training organization that conducts and publishes police-related human performance research. In our experience, demonstrating awareness of the Force Science

Institute and its work has helped law enforcement agencies better understand our goals and the type of research we seek to conduct.

Ethics approval for research

Before conducting research, researchers must typically obtain ethics approval from their institution. Expertise studies in law enforcement may involve experimental tasks with risk. For example, tasks might incorporate live-fire shooting, the use of paint-marking ammunition (e.g., http://simunition.com, https://utmworldwide.com) during role-play scenarios, exposure to oleoresin capsicum (i.e., pepper) spray, defensive tactics using electric shock knives (e.g., www.shocknife.com), high-speed driving, intense physical activity, and the use of a shootback cannon during video-based simulations. Aside from the potential for physical injury, there is also the possibility that participants will experience high levels of stress and anxiety. In fact, some studies specifically aim to manipulate the level of stress and anxiety. Given these factors, it is understandable that institutional review boards and research ethics committees will scrutinize applications.

Researchers can facilitate the ethics process by foreshadowing and pre-emptively addressing common concerns. For instance, one way to deal with the risk of injury is to plan research around existing training activities (i.e., activities that would be occurring whether the researchers were present or not), and using those opportunities for the purpose of collecting data. We also find it helpful to

attach a letter of support from the collaborating law enforcement agency, stating that the planned experimental tasks are in fact routine training activities conducted under the guidance of experienced instructors, and listing the safety precautions that are in place for such training.

Another reasonable concern is that due to the hierarchical nature of law enforcement organizations, with their inherent power imbalances, personnel may be coerced by supervisors, either explicitly or implicitly, into participating in research. For example, an officer may feel that they will get passed over for a promotion or transfer opportunity if they refuse to participate in a research study. Such coercion would contravene the ethical mandate that participation in research be voluntary. Concerns about coercion can be addressed by stating that the researcher will be given the opportunity to address officers directly and solicit their participation, without a superior officer present. During this time, researchers should take due care to explain the voluntary nature of research participant.

Gaining access to officers as research participants

Even when law enforcement agencies are willing to support research, another hurdle that must be overcome is the logistics of gaining access to officers who could participate. One issue that may arise is that officers may be represented by a union that has concerns about whether data collected (e.g., about officers' decision-making abilities or shooting accuracy) could later be used as evidence

against officers. We typically respond to this concern by stating that, as researchers, we: (a) adhere to an ethical code that places a strong emphasis on protecting the welfare of research participants, and (b) will keep participants' study-related information confidential to the extent permitted by law.

Ideally, the collaborating law enforcement agency will allow officers to participate in research during their scheduled shifts or mandatory training time. However, this is not always possible; many law enforcement agencies are understaffed and cannot afford to take officers away from their regular duties or their highly structured training schedule. Recruits can also be simply exhausted due to the intense academic and physical demands of their training. Additionally, larger regional training academies may not be in a position to directly facilitate access to potential participants. Such academies serve many law enforcement agencies, with each class comprising a few students from each agency. While at the academy, recruits are paid by their employing agency, which often imposes strict limitations on activities that fall outside of the mandatory training (e.g., because there are no funds available to pay for overtime). An alternative is to offer an incentive (e.g., gift voucher) for officers to participant when they are not on duty.

Note too, that not all recruits enter training with limited skills. Trainees with prior military experience might be expected to perform better under stress, and have higher levels of shooting and defensive tactics skills. Additionally, in

some jurisdictions, officers who transfer from another department must complete recruit training again (even if they already have several years of law enforcement experience). Researchers would be wise to screen their samples for such individuals.

Another issue for researchers to consider is that due to the nature of expertise, there may be relatively few highly experienced officers, or 'experts,' on the force. For example, there are relatively few highly experienced tactically-trained officers. They are often on call, in training, or operationally deployed, making it difficult to gain access to them. Subsequently, researchers should be prepared to have only limited access to domain experts and select their research methods accordingly. Researchers should thoroughly pilot test all procedures before collecting data with law enforcement personnel, and have a sufficient number of trained researchers on hand to ensure that data collection proceeds smoothly and efficiently.

Lack of research funding

Specific funding for expertise studies in law enforcement is difficult to come by. Individual law enforcement agencies typically do not have the financial resources to fund research studies, although they may be willing to support research by providing access to participants, facilities, equipment, and instructors/safety personnel. Whilst 'in-kind' contributions like these, if costed, can add up to large investments and should not be under-estimated, some form of

financial contribution is usually necessary for the successful completion of research projects. An exception can occur for larger agencies; for example, the New York Police Department commissioned a report on firearm training (Rostker et al., 2008). From time to time, national funding bodies present requests for proposals that could encompass expertise research in law enforcement. In the United States, such agencies include the National Institute of Justice, National Science Foundation, and military research funders (e.g., Office of Naval Research, Army Research Lab). Other potential funders include insurance pool programs that provide insurance coverage to municipalities and police departments (see Aveni, 2008). Such programs have a vested interest in reducing pay-outs due to poor training and negligence. The US Federal Law Enforcement Training Centers (FLETC), although not a direct funder of research, has an Applied Research Branch which has produced research on police performance (e.g., Federal Law Enforcement Training Center, 2004). FLETC has mechanisms for establishing collaborations with universities, and also offers internship opportunities for undergraduate and graduate students interested in human performance research through the Department of Homeland Security.

Access to representative video stimuli

For researchers interested in perceptual and decision-making expertise, video-based stimuli can provide a greater degree of ecological validity than pictorial or text-based stimuli. However, obtaining access to representative stimuli

can be challenging. One solution is to acquire a law enforcement judgment-and-decision-making simulator, which includes a library of videos scenarios. Although there are several companies producing such simulators (e.g., www.lasershot.com, www.meggitttrainingsystems.com, www.milorange.com, www.cubic.com, www.titraining.com, and www.virtra.com), the simulators are relatively expensive, placing them beyond the reach of many researchers. Note, though, that several simulator companies do offer their video scenario library as a stand-alone product.

Even if such video stimuli can be obtained, researchers still need to evaluate the stimuli and determine whether any are suitable for their research purpose (i.e., depict truly representative tasks). To gain more control over the stimuli, some researchers have produced their own video stimuli for research (e.g., Aveni, 2008; James, Klinger, & Vila, 2014; Johnson et al., 2014). Depending on the complexity of the scenarios to be filmed, researchers should be aware of factors they might need to control while filming multiple trials. These factors include the actor's facial expression, arrangement of clothing, speed of physical actions, and furtive movements/glances (see Aveni, 2008). Employing police officers to play the role of suspects can enhance the realism of stimuli, as officers are more familiar with typical behaviors exhibited by civilians in police-citizen encounters, and better at deploying weapons. If trained actors are used, researchers should either employ actors with weapons-handling experience, or

provide instruction in weapons handling prior to filming.

Researchers should ensure that, in addition to scenarios that require officers to respond using force (e.g., shoot), they also include 'don't shoot' or 'no-threat' scenarios. This is necessary, as participants could exhibit a response bias (e.g., always respond by shooting). The appropriate ratio of threat to no-threat stimuli is an open question, and depends on the research goal. A common standard is to present equal proportions of threat and no-threat stimuli (Correll et al., 2007; James, James, & Vila, 2016; Nieuwenhuys, Savelsbergh, & Oudejans, 2012). Other researchers have used a higher proportion of threat stimuli (e.g., 65%, Johnson et al., 2014).

Using live role-play scenarios

In law enforcement, live role-play scenarios (also known as reality-based or force-on-force scenarios) are considered to be the most realistic type of training available for the development of tactical skills. Researchers have used live role-play scenarios as a basis for investigating human performance (e.g., Brisinda et al., 2014; Federal Law Enforcement Training Center, 2004). In these scenarios, officers interact with 'suspects,' who act out pre-defined roles. Officers are typically equipped with specially-modified weapons that fire paint-marking rounds. Depending on the scenario, the suspect may be similarly armed, armed with a different weapon (e.g., replica knife), or unarmed. Because the marking rounds are designed to inflict a pain penalty, both the suspect and the officer must

don protective equipment, including face masks. This can hamper verbal communication and also hides the suspect's face, obscuring potential cues of an impending attack. Laser-based systems that provide feedback via electric shock have been developed to overcome this issue (e.g., www.stressvest.com), but are less common.

Another issue is the reproducibility of the suspect's actions across participants. It is impossible to achieve the same level of experimental control using live-role player scenarios compared to video stimuli. Researchers who use live-role player scenarios should take steps to train the actors to produce the same movement repeatedly. This can involve extensive drilling and practice so that the actors are given the opportunity to refine their actions, so as to minimize the variability of their body posture, facial expressions, verbal communication (i.e., content, tone, volume), and physical actions between trials/participants.

Illustrative examples of how research has been conducted in the context of expertise in law enforcement.

We now turn to provide selected, illustrative examples of research accomplishments to date, including key details of methods used. We focus on expertise studies related to decision making in tactical situations. We cover a variety of cognitive task analysis methods, including retrospective interviews, gaze tracking, temporal occlusion, and option generation. Generally, the studies

described in this chapter all have the common aim of identifying strategies and/or skills that separate expert from novice decisional performance, with a view to making evidence-based recommendations for accelerating the acquisition of decision-making skill. For examples utilizing other methods, readers are referred to studies on driving (Crundall, Chapman, Phelps, & Underwood, 2003; Crundall, Chapman, France, Underwood, & Phelps, 2005), intoxication judgments (Langenbucher & Nathan, 1983; Pisoni & Martin, 1989), and shooting performance (Landman, Nieuwenhuys, & Oudejans, 2016).

Use of retrospective report methods to understanding cognition during critical incidents

      To identify the cognitive processes and strategies that support superior decision-making performance during armed confrontations, Boulton and Cole (2016) conducted critical decision method interviews with UK firearms officers. Experienced firearms officers had at least ten years' of specialized experience; less-experienced firearms officers had three or less years' experience in the role. During the interviews, officers were asked to walk through a 'challenging' and non-routine armed confrontation that they have experienced. Note that the critical decision method interview protocol has been successfully used by several researchers to develop insight and understanding of the cognitive processes, skill and strategies used during critical decision making circumstances (Harris, Eccles, Freeman, & Ward, 2016; Klein, Klein, Lande, Borders, & Whitacre, 2015).

In line with guidelines and recommendations for conducting critical decision method interviews (Crandall, Klein, & Hoffman, 2006), multiple sweeps were made through the recalled incidents: (i) initial free recall of incident by the participant, (ii) interviewer recount to establish consistency, (iii) incident timeline creation and identification of decision points, (iv) decision point probing, and finally (v) hypothetical probes. The researchers used a script to ensure that the order and content of the probe questions was standardized across all officers. A large pad of paper was used to draw the timeline for each incident; this then served as a visual aid to identify and examine key decision points using the probe questions. The interviews lasted between 1–2 hours each; each interview was audio recorded and transcribed for analysis.

During analysis, the researchers read the transcripts multiple times noting repeated themes and cognitive issues (e.g., cue recognition, situation assessment). The transcripts were then inductively coded for repeated ideas, which were reviewed and grouped into themes and subthemes. This process was iterative and involved multiple revisions. To increase validity of the analysis process, qualitative data analysis software NVivo 10 (QSR International) was used to create a transparent and 'auditable footprint' (Sinkovics & Alfoldi, 2012) of the analysis. To demonstrate the objectivity of the research method, analysis and the conclusions, qualitative assessments were tested for inter-rater reliability using Cohen's kappa to quantify the level of consistency among two independent raters

who coded 30% of the data. Data were consolidated into a decision requirements table which was used to represent key decisions and to organize recalled cues, strategies and practices associated with expertise, as well as identify specific challenges, potential pitfalls and errors that were typically associated with inexperience.

The results highlighted the importance of adaptability as a defining feature of expert decision making in the context of armed confrontation. This key finding was used to make recommendations for police firearms training which seeks to accelerate the development of adaptive decision making skills (i.e. mental modelling, sense-making, and cognitive flexibility) through the systemic exposure of trainees to a variety of scenarios, including 'worst-case' scenarios, that cannot be solved through standard operating procedures.

Expertise differences in visual attention during shoot/don't-shoot scenarios

Vickers and Lewinski (2012) investigated differences in performance and visual attention between less-experienced and experienced tactical team members. The research incorporated live role-player scenarios, handguns adapted to fire paint-marking ammunition, and a mobile eye tracker. The scenario was set in a government office, with the armed officer providing security inside. A female receptionist sat at a desk and was approached by a male who wanted to resolve an issue with his passport. The officer wore the eye tracker and stood 7 meters from the desk, facing the receptionist (i.e., observing the male from behind). The

officer was confined to that location and instructed to resolve any threat using their handgun (i.e., they were not allowed to approach the male). The male became more and more agitated and began arguing loudly with the receptionist. Approximately 50 seconds after entering the office, the male spun around to face the officer while drawing either a handgun or a cell phone. The officer responded by either shooting at the male or inhibiting a shooting response. After an initial 'gun' trial, each officer completed four gun trials and two cell phone trials in a randomized order.

Officers' gaze behavior and physical responses were recorded synchronously using the vision-in-action system (Vickers, 2007). Performance analysis focused on the initial 7 seconds—when the male role player entered the scene—and on the final 7 seconds leading up to the shoot/don't-shoot decision. In the final 7 seconds, for example, the researchers identified three phases of observable response (i.e., draw firearm, hold firearm, aim/fire). The onset and duration of each phase was determined via the video recording, and then analyzed using experience as a between-subjects factor. The analysis of gaze behavior focused on the final six fixations leading up to the shoot/don't-shoot decision (i.e., when the male role player spun around). Fixations were coded by location (i.e., assailant's weapon/cell phone, other locations on assailant's body, not on assailant, officer's firearm/sights).

Vickers and Lewinski's (2012) results were used to make specific

recommendations to police firearms training in terms of target fixation, weapon

alignment and the type of conditions training should be conducted under (i.e. high

levels of pressure and anxiety). Based on these findings, they suggested that

changes in police training consistent with their recommendations would

contribute to better decision making and performance in less-experienced officers.

Use of a temporal-occlusion and option-generation paradigm

Suss and Ward (2012) used video scenarios from a police judgment and

decision-making simulator (www.milorange.com) to examine skill-based

differences in anticipation and response ability. The researchers first identified

candidate video clips of high- and low-frequency law enforcement situations in

which there was sufficient context with which to anticipate the outcome. Then,

each video was edited to end (i.e., black screen) at a point where it was possible,

in theory, to correctly anticipate the outcome. Less-experienced and experienced

police officers observed each clip. To elicit anticipation options, officers

responded to the question, "What could happen next on the screen in the next few

seconds?" After listing their anticipation option(s), they assigned likelihood

ratings to each option (likelihood ratings totaled 100), and rated how threatening

each option was if it were to occur next (each option was rated independently on a

scale ranging from 0–100). After generating anticipation options, officers were

prompted to generate response options: "How could you respond in the next few

seconds?" Officers then rated the likelihood with which they would pursue each

option, and how good each option was for their own personal safety.

After gathering the data, each option was classified by a subject-matter expert as being either relevant or irrelevant with respect to the specific situation. The analysis focused on experience-based differences in the number and type (relevant/irrelevant) of options generated, and the relationship between the number of options generated in the prediction and response phases (i.e., does generating more prediction options result in the generation of better responses options?).

As the other two studies did, the results from this research were used to make specific recommendations for improving the decision making skills and performance of less-experienced officers. These recommendations suggested that to improve prediction accuracy and lead to better response options, training should be designed to reduce officers' focus on irrelevant options rather than aiming to increase the generation of relevant options.

Key insights: Task-specific expertise

The general public, perhaps driven by TV depictions of police, often see police officers as superheroes, imbued with decision-making abilities that exceed those of the average citizen. Therefore, a general perception remains that police officers are 'expert' decision makers more broadly, and expected to behave expertly based on their intuition and hunches (Alschuler, 2007; Segal, 2012). This

is despite findings that demonstrate that police are susceptible to decision biases,

just as non-police officers are (Ask & Granhag, 2005; Fahsing & Ask, 2013;

Taslitz, 2010).

This perception also appears to be evident in academia, where some

researchers have compared police officers as an 'expert' group to the general

public as a 'control' group. Others have relied on years of police experience as a

proxy for expertise (e.g., Fulford, 2011), rather than defining expertise based on

evidence of performance reproducibility (Ericsson & Ward, 2007). However, law

enforcement is a profession encompassing many tasks that require a combination

of skills of which someone could have expertise in. Therefore, it is difficult to

determine that there is such a thing as "general" law enforcement expertise.

Instead, expertise in law enforcement often encompasses skill

specialization. For example, officers' decision-making processes may vary

depending on their specific role (e.g., investigative vs. tactical and/or strategic).

Reflecting this, we should remain clear on the area of expertise that we are

examining in order to ensure the officer's experience within their role evidences

their status as an expert within that specific field. With this in mind, a review of

the key insights into task-specific expertise within law enforcement was

conducted to identify how academia, police, and the justice system talk about and

address expertise. Some key research findings regarding selected types of policing

expertise (i.e., decision making, tactical skills, conflict resolution and social skill,

visual perception and observation) will be discussed here.

Decision making

Studies have examined a variety of different applications to decision-making expertise in law enforcement. Some have focused on identifying psychophysiological indices of expert versus novice performance in deadly force judgment and decision making (Johnson et al., 2014); others have explored how expertise impacts police officers' assessment of operational situations (Baber & Butler, 2012). Although there is a big difference between tactical (fast) and strategic/investigative (slow) operational tasks, the common thread in both types of law enforcement roles is the need for appropriate decision making.

Comparing the decisional processes and strategies underlying the performance of expert and novice British firearms officers during armed confrontations, Boulton and Cole (2016) highlighted the importance of adaptability in terms of the flexible application of experiential knowledge, strategies and skills in response to situational demands, to expertise in this context. With their extensive domain experience, expert officers were better able to: (i) categorize incidents; (ii) recognize anomalies; (iii) be aware of, and quickly adapt to, the dynamic environment; and (iv) use their training automatically. Compared to the flexible experiential-based decisions of expert officer, novice officers reported a more sequential and linear process of tactical decision making that involved extended verbalizations and continued conscious processing

throughout. Girodo's (2007) experimental study also revealed that generally, tactical experts (e.g., tactical force leaders) reasoned analytically and deliberatively compared to the more reactive and procedural reasoning exhibited by non-expert tactical force officers.

A between-groups (expert vs. novice) comparison of EEG/physiological response during high fidelity deadly force judgment and decision-making simulations conducted by Johnson et al. (2014) found that not only did experts (defined as police or military experience) have a significantly higher pass rate compared to novices, but that this difference was also reflected in physiological responses. Heart rate acceleration from rest during the scenario was significantly greater in the expert group and this was suggested to be linked to more responsive threat detection.

Despite findings of cognitive processing and physiological response differences between experienced and less-experienced officers in firearms situations, such differences have not been conclusively found to result in superior performance. When comparing shooting behavior in simulated firearms environment, Ho (1994; 1997) found that rookies consistently displayed better judgment and shooting accuracy than veterans, in that: (i) rookies had a higher survival rate than veterans when responding to life-threatening situation, and (ii) rookies showed better judgment than veterans in averting or withholding fire when confronting a harmless suspect during high-risk encounters. Such surprising

results may reflect the more advanced and up-to-date training rookies received compared to veterans in the sample (Doerner & Ho, 1994). In a quasi-experimental, between-subjects contrast of handgun-shooting skill in police recruits with differing shooting experience, Lewinski, Avery, Dysterheft, Dicks, and Bushey (2015) concluded that trained officers had no advantage over intermediate shooters and only a small advantage over novices.

Studies which explore racial bias in police shoot/don't shoot decisions have typically compared a police sample, as an expert group, to a civilian control sample. Generally, these studies have found a reduced racial bias in the decisions of officers compared to civilians, however they also identify important complexities within this finding that is impacted by situational features (Correll, Hudson, Guillermo, & Ma, 2014; Luini & Marucci, 2015; Sim, Correll, & Sadler, 2013). Correll et al. (2014) compared police officers and civilians on a first-person shooter task designed to examine racial bias toward African-Americans and found that the police officers were faster, more accurate and less racially biased in terms of errors; however, officers still exhibited a bias toward shooting unarmed African-American males. These findings suggest that expertise enabled officers to minimize behavioral consequences of stereotypes (i.e., learned to override a pre-potent response) via exercise of cognitive control. The final part of this study examined if training could reduce racial bias responses and found that, although promising results indicated training did eliminate racial bias in

controlled conditions, this bias could re-emerge under conditions of high

cognitive demand. This has important implications for training, indicating that it

is crucial for police to train in situations that replicate operational settings (i.e.

intense video or live-action simulation that induce high arousal). Sim et al. (2013)

also found that when compared with lay participants, police officers generally

showed less racial bias in laboratory-based shooter simulations (Correll et al.,

2007), however when the training context or operational experience reinforced

officers' association between African-Americans and danger, training did not

seem to attenuate bias.

Another task in which decision-making expertise has been investigated is

urban house-clearing operations. Harris-Thompson, Wiggins, and Ho (2006)

employed cognitive task analysis techniques (see Crandall et al, 2006; Hoffman &

Militello, 2008) to identify the critical decisions and cues used to assess these

dynamic and potentially dangerous situations. The cues were classified into four

types: environmental assessment (e.g., noticing whether hinges on doors open

inward or outward), threat assessment (e.g., watching the suspect's hands),

situational assessment (e.g., time of day), and team assessment (e.g., hearing a

team member call for backup). Experts' performance appeared to rely on their

ability to rapidly switch between following standard operating procedures on the

one hand, and making recognition-primed decisions (Klein, 1989) based on the

dynamic, unfolding events, on the other.

In a slower-paced decisional police environment, Baber and Butler (2012) compared novice and expert crime scene examiners' search strategies in simulated crime scenes using concurrent verbal protocol analysis and head-mounted video recordings. Baber and Butler found that although both groups paid attention to the likely modus operandi of the perpetrator (in terms of possible actions taken), the experts paid more attention to objects with evidential value based on consideration of the potential future analysis and actions that can be taken. Therefore, expertise in the specific area of crime scene investigation lays in the selective search strategies towards objects of evidential importance and involve predictive mental modelling.

Conflict resolution and social skills

Researchers have also sought to identify the social skills that lead to successful, positive police-public interactions. Sun (2003) examined the behavioral differences between police field-training officers, who provide on-the-job mentoring to rookies, and their comparable colleagues in handling interpersonal conflicts. Sun found that field-training officers performed a greater number of supportive actions than non-field-training officers throughout their encounters with citizens. Similarly, Klein and colleagues' (Klein et al., 2015; Lande & Klein, 2016) 'Good Stranger' research concluded that expertise in managing civilian encounters without creating hostility was most significantly predicted by officers' ability to build trust. In turn, the ability to take another's

perspective and gauge prudent risk significantly predicted the ability to build trust. Furthermore, the researchers identified several pathways for acquiring a Good Stranger frame, including observing role models, peer pressure, becoming more effective at gaining civilian cooperation, and recognizing the problems created by failing to build trust.

Tactical Skills

In terms of tactical skill expertise, research has predominantly explored the utility of training to increase or accelerate skilled performance. For instance, Renden, Landman, Savelsbergh, and Oudejans (2015) found that engagement in martial arts training benefited defensive tactics (i.e., hand-to-hand combat) performance under threatening conditions and suggested that this improvement reflected the development of anticipation skills and ability to counterattack. Staller and Abraham (2016) interviewed expert self-defense instructors about the characteristics of optimal training environments. The main themes included understanding the nature of violent attacks, learning and teaching how to solve problems, achieving a balance between realism and safety in training, and providing trainees with opportunities for deliberate practice. Developing expertise in defensive tactics is especially important in countries where police are routinely unarmed, and in jurisdictions that encourage the use of non-lethal force when safe for officers.

Firearms proficiency is lacking in US law enforcement, where officers

typically receive only 50 hours training and/or training that lacks validity (Charles & Copay, 2003). Biggs, Cain, and Mitroff (2015) not only found shooting error to be negatively correlated with the cognitive ability to inhibit an initiated response, but also that active response-inhibition training reduced error. Therefore, Biggs et al.'s findings indicate that there is potential to improve shooting performance and thus increase or accelerate shooting expertise via cognitive training. Charles and Copay (2003) conducted a repeated-measures comparison of inexperienced shooters before and after basic law-enforcement firearms training. They found that marksmanship skill significantly improved after training, and that participants were significantly quicker to load, reload, unload, and clear malfunctions after the course. Furthermore, they suggested that specificity of training relative to performance requirement was crucial to skill attainment and that scenario-based training that included an element of stress was most effective. Other tactical research related to firearms compared the efficacy of different room-entry techniques used by police when searching buildings (Blair & Martaindale, 2014).

Research into use-of-force (e.g., defensive tactics, shooting) skill perishability and retention suggests that there is some scientific basis for providing explicit knowledge of results to trainees early on in training, but then decreasing this as skills become automatic (Angel et al., 2012). This paper concluded that the critical factors that influence skill retention are: the characteristics of the individual, the nature of the task and the nature of the

training that should expose trainees to as many different situations as possible to promote knowledge, skill transfer, and adaptability (Angel et al., 2012; Boulton & Cole, 2016).

Visual perception and observation skills

Some literature suggests that expert performers' advantage is due to their perceptual abilities and observation skills. Generally, experienced operators make eye movements towards expected goal-relevant areas of the scene or an increased frequency of fixations on goal-relevant information (Crundall & Eyre-Jackson, 2015; Howard, Troscianko, Gilchrist, Behera, & Hogg, 2013). Vickers and Lewinski (2012) investigated differences in performance and visual attention between experienced and less-experienced firearms officers during a shoot/don't shoot decision making scenario. Compared to the less-experienced officers, experienced officers (a) drew their guns earlier in the scenario, (b) fired at the assailant less frequently in the cell phone condition, (c) shot before the assailant did on a greater percentage of trials in the gun condition, and (d) hit the assailant more frequently in the gun condition. Analysis of the eye-tracking data revealed that experienced officers fixated more locations on the assailant where a weapon could be concealed and more of the experienced officers fixated on the assailant's weapon or cell phone than did less-experienced officers. Compared to the experienced officers, more of the less-experienced officers fixated on their own weapon (e.g., sights), non-weapon locations on the assailant, and off the assailant,

suggesting a difference in officers' weapon focus and the role of optimal gaze control when under extreme pressure and threat which could be utilized in firearms training.

Crundall and Eyre-Jackson (2015) conducted an independent group comparison of criminal activity prediction from CCTV clips between police officers and a control group. Signal detection analysis revealed that the police officers were marginally more accurate than the control group at detecting imminent criminal activity or anti-social behavior, and that the police were better than the control group at identifying the type of crime about to happen. Based on these results, Crundall and Eyre-Jackson suggested that the benefit of expertise in this task lies in the ability to direct visual attention to the most relevant locations in the footage, at the most appropriate time.

Along similar lines, Koller, Wetter, and Hofer (2016) examined the ability to use nonverbal behavior to detect imminent baggage theft at an international airport. Civilians, police recruits, inexperienced officers, experienced officers, and criminal investigators observed video clips of actual baggage theft incidents that were temporally occluded prior to the theft. At the point of occlusion, participants indicated the individual(s) they anticipated would commit theft. Signal detection analysis revealed that criminal investigators—who were most familiar with the thieves' modus operandi—exhibited better sensitivity than all other groups, except experienced officers. Experienced officers were, in turn, more sensitive

than civilians and recruits, but not inexperienced officers.

Observation is crucial to certain aspects of law enforcement work and investigation. Exploring the impact of expertise on incident report-writing skills, Vredeveldt, Knol, and van Koppen (2017) found that surveillance detectives provided more accurate incident reports that may serve as evidence in court than both untrained civilians and uniformed police officers, suggesting that specialized detectives on surveillance teams are more observant of the crime-relevant aspects of an incident. In a related surveillance task, Stainer, Scott-Brown, and Tatler (2013) found that trained CCTV operators spent most of their time searching on the single-scene spot-monitor, rather than spending a lot of time viewing the multiplex wall, suggesting a selective approach based on crime likelihood prediction. Damjanovic, Pinkham, Clarke, and Phillips (2014) examined the ability of experienced officers with extensive riot control experience to identify threats within the context of emotional and neutral faces. The experienced officers showed enhanced detection for threatening faces and greater degree of inhibitory control over angry face distractors, compared to trainee officers and civilians.

Future directions

Societies are justly concerned about appropriate use of force by police. Academic research—particularly expertise research—has had relatively little direct impact on law enforcement training practices. We believe, therefore, that expertise researchers can make significant contributions by establishing training

methods that are accessible, easily implemented, directly relevant to police work, and whose efficacy is empirically supported. Here, we propose ideas based on our experience working with, and observing, law enforcement.

Police officers must excel at perceptual discrimination under stress (e.g., real firearm vs. replica firearm, armed undercover officer vs. armed suspect; see Band, Ray, Wollert, & Norris, 2016). Employing methods from visual cognition and sport science, researchers should identify whether skill exists in these perceptual discrimination tasks. If expertise is identified, researchers should examine the cognitive mechanisms that underlie skilled performance, and develop and evaluate training methods to improve novices' ability. Ericsson's expert performance approach (Ericsson & Ward, 2007) can serve as a guide to such an endeavor. Similarly, researchers should assess whether highly-trained officers excel at anticipating a suspect's actions (i.e., whether the suspect is drawing a weapon versus a nonweapon from concealment). This line of research could leverage temporal- and spatial-occlusion methods that have been used to investigate anticipation in sport, and identify the cues used by experts.

A related line of research would seek to develop gamified, web-based tools that provide opportunities to deliberately practice perceptual-cognitive skills. This would be particularly useful during police academy training, during which trainees often have periods of downtime (e.g., when instructors are running trainees individually through role-play scenarios). A web-based training tool

would allow trainees to engage in deliberate practice of otherwise difficult-to-train skills, without required the presence of an instructor. Recently, researchers have created a platform to support domain-specific cognitive training that incorporates expert feedback (e.g., Klein & Borders, 2016).

Another challenge for expertise researchers is to identify how to optimally integrate different training modalities (e.g., static live fire, dynamic force-on-force, interactive video simulation, defensive tactics, less than lethal) to create adaptive experts. It is relatively common for police instructors to specialize in either defensive tactics or firearms, creating training 'silos' (Force Science, 2016). Trainees, however, need to be able to integrate all of these skills in use-of-force situations, possibly transitioning from aiming their firearm to using physical combat skills in response to a suspect's actions. Although recent research has described an approach for designing integrated training (Staller, Bertram, & Körner, 2017), there is a lack of empirical evidence that details when, how much, and what type of force-on-force training (e.g., using paintball-marking ammunition) should be introduced during training. Note that researchers have investigated debriefing and feedback techniques for force-on-force training (e.g., Phelps, Strype, Le Bellu, Lahlou, & Aandal, 2016; Sjöberg & Karp, 2012).

Finally, expertise researchers should evaluate the relative efficacy and efficiency of different types of training for improving performance. Recently, training designed to "reduce psychological threat perception and improve

physiological control" was found to improve Finnish tactical officers' decision making (Andersen & Gustafsberg, 2016, p. 6; also see Andersen et al, 2015; Shipley & Baranski, 2002). This training incorporated mental imagery and breathing control. An interesting question is whether this type of training—or perceptual-cognitive skill training—results in better performance given equal training time, and which type of training is easier to deliver and more readily accepted by trainees.

To achieve these goals, we encourage researchers to engage with the law enforcement community and learn about the many challenges it faces in developing adaptive experts. Researchers without a background in law enforcement should consider partnering with 'pracademics': researchers interested in studying their own work domain (Huey & Mitchell, 2016). Alternatively, researchers should establish collaborations with practitioners (see International Association of Chiefs of Police, n.d.). A collaborative approach can improve the quality of the research; skilled researchers can increase the reliability of the findings, whilst the subject matter expertise of practitioners can increase the validity and applicability of the findings to the real world. A particularly fruitful collaboration has been that between the Dutch national police and researchers at VU University Amsterdam (e.g., Nieuwenhuys, Caljouw, Leijsen, Schmeits, & Oudejans, 2009; Nieuwenhuys et al., 2012). Finally, researchers should ensure that the research they conduct will produce value for the practitioners (Rynes,

Bartunek, & Daft, 2001). Offering practitioner-friendly summary reports of the

research or conducting workshops to disseminate findings may more effectively

communicate the impact of the research than sharing the resulting academic

journal articles.

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