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A Police Officer's Tacit Knowledge Inventory (POTKI): Establishing Construct Validity and Exploring Applications

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Abstract

Research summarizes the development and validation of the Police Officer's Tacit Knowledge Inventory (Inventory), a situational judgment test comprised of knowledge gained on-the-job by experienced police officers, and examines if it plays a role in the accelerated development of expertise. Criterion validity was established by correlating Inventory scores with two previously validated measures: the Common Sense Questionnaire (CSQ) and Sternberg Triarchic Abilities Test-Practical Intelligence (STAT-PI). Correlation and regression analysis was also done to establish the Inventory's ability to predict post-Academy graduation performance. Results show significant correlation between Inventory and CSQ responses; Inventory response patterns correlate with Supervisor ratings; and the Inventory responses are significantly different between novice patrol officers and experienced police officers.

Keywords: tacit knowledge, problem-solving ability, police training, adult learning, situational judgment test, development of expertise.

Introduction

Expertise in any profession is a combination of many factors, and typically includes advanced knowledge, skills, and abilities developed through years of experience (Bedard & Chi, 1992; Chi, Glaser, & Farr, 1988). Within the police profession, expert police officers are individuals who possess innate traits and abilities supplemented with a great deal of knowledge gained through formal training, as well as on-the-job experiences. One important element of expertise is knowledge, which can be divided into explicit or 'declarative' knowledge and implicit or 'tacit' knowledge (Sternberg & Hedlund, 2002). The present study examines the role tacit knowledge, that which is gained on-the-job, and not formally taught, plays in the development of expertise, and how that knowledge influences one's ability to solve problems (Sternberg & Hedlund, 2002). Effective problem solving involves recognition of the context in which

the problem takes place, useful information and a repertoire of strategies that may be applied towards the solution (Bedard & Chi, 1992; Chi, Glaser & Farr, 1988). A tool that is frequently used to measure problem solving ability is the situational judgment test (Weekley & Ployhart, 2006; Sternberg & Hedlund, 2002; Ambrosini & Bowman, 2001). The purpose of the research project described herein is to explore whether the incorporation of a situational judgment test type learning tool entitled a Police Officer's Tacit Knowledge Inventory (Inventory), comprised of knowledge gained on-the-job by experienced officers, into the training of novice police officers might accelerate the development of their expertise. The project was organized around three phases. Phases one and two involved the development of the learning tool and the assessment of the impact of incorporating the Inventory into the Idaho Peace Officer Standards and Training (POST) Basic Patrol Academy curriculum. Phase three involved the administration of a measure of expertise to the Patrol Academy graduates (within a year of their graduation) who worked with the Inventory at the Academy to determine the impact learning with the Inventory in basic training had on their development.

Literature Review

The Imperative of Professional Expertise

Taking the broadest perspective, expertise may be viewed as "skillful execution of knowledge and skill to achieve effective action" (Fiore, Hoffman, & Salas, 2008), which distinguishes novices from experts. Professional experts within any occupational domain are individuals with advanced knowledge, skills, and abilities who form the core of a profession and may be viewed as the standard bearers who embody the ideal combination of aptitude, knowledge, and experience (Bedard & Chi, 1992; Chi, Glaser, & Farr, 1988). However, to effectively build expertise one must be able to identify 'target' competencies as well as a trajectory path that novices can travel to acquire the competencies (Fiore, Hoffman, & Salas, 2008). Within the police profession, in addition to technical and tactical skills, there is a need for officers with expertise in ability to communicate, identify problems, think critically, engage in team building, and group problem solving (Ortmeier, 1997). While time gaining experience is the indisputable element central to the acquisition of expertise, research suggests that with adequate psychological support skills, and a structured process, the acquisition of expertise might be hastened (Fiore, Hoffman, & Salas, 2008; Eccles & Feltovich, 2008; Hinds, Patterson, & Pfeffer, 2001).

Police Officer Training

The goal of every professional training program is to produce graduates who are competent and ready to perform within that professional domain (Caro, 2011). Professional knowledge is a central component of expertise, and it can be divided into explicit and implicit or tacit knowledge (Sternberg et al., 1999; Eraut, 2000). Explicit knowledge is knowledge acquired through formal education; tacit knowledge is acquired 'on-the-job', through experience (Sternberg, et al., 1999). Experiential learning builds tacit knowledge and may be structured or unstructured and is acquired through supervised on-the-job experiences (Eccles & Feltovich, 2008; Farrar & Trorey, 2008).

Police officers work under conditions that are unpredictable and vary from highly stressful to uneventful and routine, and constructing a training program for police candidates that prepares those individuals to meet the demands of an unforgiving job is a challenging expectation (Werth, 2011). Formal training takes place at an Academy, with subsequent on-the-job training begun under the supervision of a field training officer. Prior to attending any training, police recruits are comprehensively screened for suitability, aptitude, and potential for success (McGrath & Guller, 2009; White, 2008; Super, 2006). Currently, individual states utilize different methods of training, however POST Academy programs have traditionally offered a behaviorally-oriented training curriculum that emphasizes classroom lecture, but includes training scenarios where students must assume specific professional roles and are graded on their performance (Caro, 2011; Chappell, 2007; McCoy, 2006; Birzer, 2003). The traditional curriculum prepares officers for a more narrow approach to law enforcement duties emphasizing firearms training, physical training, defensive tactics and driving, as well as law and arrest procedures, traffic enforcement, and officer safety. A more generalist approach which included communication, diversity, problem solving, and police-community relations has, until recently, been less emphasized (Chappell, 2007).

While many police training programs remain based on a traditional behavioral and militaristic approach (Birzer, 2003), as the community policing model evolves, some Academies are experimenting with new training methodologies (Donavant, 2009), or are implementing curricula based on adult learning theory and oriented towards problem-based learning (Werth, 2009, 2011; Knowles, 1988) to transition from traditional to community oriented policing (COP) and problem oriented policing (POP) training models (Werth, 2011; Chappell, 2007; Birzer, 2003). Concurrent with a trend across the United States, Idaho police agencies are proactively seeking ways to strengthen learning organization goals as well as develop community and problem-oriented policing expertise (Werth, 2011, 2009; Crank & Giacomazzi, 2009; Russell, 2009; Masterson & Stevens, 2001). Teaching models differ with respect to how effective they are in facilitating the development of knowledge, skills and abilities among adults and Ortmeier (1997) has argued that a behaviorist model might be more effective in teaching technical and procedural skills, but less effective in promoting the acquisition of problem-solving, judgment or leadership abilities and that police training theories should evolve with this philosophical change and employ andragogical theory based on adult learning principles.

Concurrent with this nationwide shift, research has found that the typical Academy curriculum accounts for only 10% of the variance in post-Academy performance (Caro, 2011), and researchers within the police profession have called for the development and utilization of professional knowledge management systems that better capture knowledge based upon on-the-job experience, termed tacit knowledge (Dean, Fahsing, Glomseth, & Gottschalk, 2008). Thus, in addition to the nationwide 'recalibration' of training procedures as the profession evolves under a new policing philosophy, police professionals are exploring ways to better manage the explicit and tacit knowledge necessary to effective problem-solving (Donavant, 2009; Dean, Fahsing, Glomseth, & Gottschalk, 2008).

Aptitude

Aptitude is defined as: "1) The quality of being apt or appropriate; fitness; 2) natural tendency or inclination; 3) a natural ability or talent; 4) quickness to learn or understand." (Webster, 1988). Within the police profession, recruit screening for aptitude is done with the following instruments being used at more than 50 percent of the agencies: Minnesota Multiphasic Personality Inventory, MMPI, (Hathaway & McKinley, 1991) (distinguishes normal from abnormal personalities); the Inwald Personality Inventory (predicts the behaviors and attitudes that are likely to result in on-the-job failure in high-risk law enforcement, corrections, and security occupations) (Inwald, 1979); the California Personality Inventory, CPI, (Gough, 1994) (measures such things as poise, self-assurance, interpersonal effectiveness, socialization, maturity, responsibility, achievement potential, intellectual efficiency, and interest modes) (Kaplan & Saccuzzo, 2013); and the Wonderlic Personnel Test, WPT, (tests mental ability) (Wonderlic, 1992) (Super, 2006). A survey of personality measures used in screening police recruits show a moderate level of predictability of performance (Varela, Boccaccini, Scogin, Stump, & Caputo, 2004). While many agencies screen based on personality, psychologists serving federal, state, and local law enforcement agencies have called for pre-employment evaluations that include not only personality tests, but also a test of psychopathology and a test of cognitive or problem-solving ability (McGrath & Guller, 2009; White, 2008; Super, 2006). Going back to the definition of aptitude, which is a "quickness to learn or understand"…embedded in this definition is the notion of learning which is related to the acquisition of knowledge accompanied by the ability to apply that knowledge to adapt to a changing environment, a notion central to the ability to problem-solve.

Problem-Solving

Experts, which include police experts, differ from novice recruits in the amount as well as the structure of knowledge, in how they solve problems, specifically, in the area of problem representation, problem solving strategies, and decision quality (Salas, Rosen, & DiazGranados, 2010; Wiley, 1998; Bedard & Chi, 1992), and in how they bring about successful problem resolution, e.g., the structure of the problem, their approach, how they handle the lack of a 'right' answer, etc. (Bedard & Chi, 1992; Chi, Glaser & Farr, 1988). Problem solving ability has been shown to be predictive of success on-the-job (Fiore, Hoffman & Salas, 2008; Hedlund, Wilt, Nebel, Ashford, & Sternberg, 2006).

Problem solving can be enhanced by experience, but the ability to problem solve is not exclusively governed by how much experience one has. The combination of formal training and on-the-job experiences shape expertise and problem-solving ability (Zeitz & Spoehr, 1989). The solutions one chooses in response to novel problems may be relatively better or worse choices and are related to experience and levels of tacit knowledge (Boyce, LaVoie, Streeter, Lochbaum, & Psotka, 2008; Klein, 1997). For many problems, there is no one 'right' or 'wrong' answer. In fact, in life and certainly for problems faced by police officers, there are multiple approaches an officer can take to achieve a

desirable outcome or to exacerbate a problem. Experts and novices differ in how they define problems as well as the responses, including good versus bad response options because novices do not possess as varied a repertoire of experiences from which to formulate response options (Legree, Psotka, Tremble, & Bourne, 2005; Chi, Glaser, & Farr, 1988). The ability to think 'outside the box' or apply divergent thinking skills can also influence response option choices (Lam, 2000; Mumford, Marks, Connelly, Zaccaro, & Johnson, 1998). At the very least as one matures in one's profession and accumulates a variety of experiences, one potentially accrues useful knowledge that can be shaped and applied to solving novel problems, and develops a sense of what not to do (Narvaez, 2010; Pretz, 2008; Tallman, Leik, Gray & Stafford, 1993).

Tacit knowledge and practical intelligence and the development of expertise

Practical intelligence is viewed as developing expertise (Sternberg & Kaufman, 1998), and tacit knowledge as its manifest indicator (Sternberg, et al., 2000). Practical intelligence is an innate ability – different from general or academic intelligence – and is defined as the ability to perform successfully in naturalistic settings and adapt to, select, and shape environment in the pursuit of personally valued goals (Sternberg & Kaufman, 1998; Hedlund, Sternberg, & Psotka, 2000). It enables people to recognize useful information, acquire and assimilate that information into one's mental structure to determine adaptive solutions to ill-defined problems (Hedlund, Antonakis & Sternberg, 2002). Practical intelligence has generally been shown to be unlike other intelligence constructs (Sternberg & Kaufman, 1998), as well as from aspects of personality (Sternberg & Hedlund, 2002).

Tacit knowledge is generally unspoken knowledge gained from experience, as opposed to explicit or formal instruction, which distinguishes the more expert individual in a particular domain, and that reflects the "practical ability to learn from experience" (Sternberg & Hedlund, 2002). Among police officers, tacit knowledge is an individual officer's practical skills, competencies, and experience (Dean, Fahsing, Glomseth, & Gottschalk, 2008). Higher levels of tacit knowledge have been found to predict performance across a number of domains, using a variety of criteria (Hedlund, Wilt, Nebel, Ashford, & Sternberg, 2006; Sternberg & Kaufman, 1998). Dean, Fahsing, Glomseth, and Gottschalk (2008) call for strategies to manage and disseminate tacit knowledge among police professionals to better build expertise.

Individuals differ in their processing styles (Salas, Rosen & DiazGranados, 2010) and in their ability to learn from their experiences, as well as to recognize and utilize information essential to the development of tacit knowledge (Cox, Hill & Pyakuryal, 2008; Eraut, 2000; Sternberg, et al., 2000). Organizational dynamics will also influence an individual's ability to learn from experiences and how effectively tacit knowledge will be shared (Lam, 2000; Tesluk & Jacobs, 1998). Taking these individual and organizational differences into consideration, methods to teach tacit knowledge may include development of adult learning skills (Dean, Fahsing, Glomseth, & Gottschalk, 2008; Knowles, 1988); psychological learning support skills (Eccles & Feltovich, 2008); facilitated discussions (Boyce, LaVoie, Streeter, Lochbaum, & Psotka, 2008) and reflection (Matthew & Sternberg, 2009).

Individual inability to acquire tacit knowledge plays a significant role in halting the learning experience (Cox, Hill, & Pyakuryal, 2008). Experience plays a role in tacit knowledge, but is not central, in other words, experience is not just a "proxy" for knowledge (Hedlund, Antonakis, & Sternberg, 2002). Tesluk and Jacobs (1998) argue that to make the most out of one's work experiences, there must be a structured approach that specifies desired outcomes. One's tacit knowledge level plays a role in how one solves problems and exercises discretionary judgment (Cox, Hill, & Pyakuryal, 2008). Additionally, tacit knowledge is influenced by intuition, with an individual's intuitive understanding of the situation subconsciously shaping their selection of better or worse responses to a problem (Eraut, 2004). Finally, it has been shown that tacit knowledge can be taught, through a facilitated discussion, and reflection methods (Matthew & Sternberg, 2009; Farrar & Trorey, 2008; Matthew, Cianciolo, & Sternberg, 2005).

Tacit knowledge is most often measured through the development of inventories, typically based on a situational judgment test format designed to capture specialized, context-specific, jobrelated knowledge acquired from experience (Weekley & Ployhart, 2006; Sternberg & Hedlund, 2002; Ambrosini & Bowman, 2001).

Situational Judgment Tests

Situational judgment tests (SJTs) are typically composed of a variety of scenarios that may be professional domain specific or non-domain specific. Accompanying the scenarios are lists of response alternatives associated with each scenario that may describe actions or problem solutions. The inventory respondent rates the various alternatives as appropriate, effective or ineffective in solving the problem presented in the scenario (Legree, Psotka, Tremble & Bourne, 2005). SJTs have been found to correlate highly with performance and are the single best predictor of subsequent performance (Koczwara, Patterson, Zibarras, Kerrin, Irish, & Wilkinson, 2012; Hedlund, Wilt, Nebel, Ashford, & Sternberg, 2006; Sternberg & Hedlund, 2002). Research has shown that SJT-based tacit knowledge inventory are a reliable and valid assessment of practical intelligence (Cianciolo, Grigorenko, Jarvin, Guillermo, Drebot, & Sternberg, 2006).

Method

The sample in this project consisted of experienced police officers representing rural and urban city, city, county and state agencies of various sizes who served as subject matter experts and police recruits attending POST basic Patrol Academy training.

The primary focus during the initial phase of this project was to develop and validate the learning tool, the Inventory, thus the first step in constructing the Inventory was to gather on-the-job knowledge from experienced police officers. Thirty-nine experienced police officers (each possessing a minimum of five years on-the-job) representing rural and urban jurisdictions were interviewed, and asked to share a story about an on-the-job experience considered pivotal to the development of expertise for that officer, with an emphasis on early career experiences.

Once the Inventory (consisting of 26 scenarios) was created, it was sent back to participating agencies, and experienced officers were asked complete the Inventory and rate each response option to establish scenario response option subject matter expert ratings. Forty-eight experienced officers and deputies, with a minimum of five years on-the-job, representing large and small agencies from throughout Idaho rated each response option. Aggregated variables were computed for each subject's response option ratings that reflected mean scores for the Better and Worse options for each scenario (Taylor, 2007). From those variables, overall Better and Worse means across all scenarios were computed. Cronbach's alpha reliabilities (Better, r=.92, n=48, p<.05; Worse, r=.76, n=48, p<.05) were acceptable. While the 'n' is small, previous research has shown that scoring rubrics can be reliably computed from a smaller number of experts (Legree, Psotka, Bludeau, & Gray, 2009). Figure 1 shows a sample scenario.

[Insert Figure 1 near here].

In the next phase, the research goal was to assess the utility of the Inventory as a learning tool for POST basic Patrol Academy attendees. To establish a baseline level of problem solving ability, attendees in two consecutive basic Patrol Academies were administered the CSQ and the STAT-PI, described below. Class #1 (n=46) and Class #2 (n=20) attendees were divided into two groups (treatment-the group worked with the Inventory, and control-the group followed the traditional training curriculum). The treatment group protocol consisted of three 1-2 hour sessions, during which participants completed selected sections of the Inventory and participated in a facilitated discussion led by an experienced police officer.

Approximately six months after POST Academy graduation, a final measure consisting of selected scales from the van der Heijden Measure of Professional Expertise (MOE) was administered at each officer's home agency. The officers and their supervisors each completed the Measure of Expertise survey, with the officers rating themselves, and the supervisor rating the officer.

Measures

Sternberg Common Sense Questionnaire (CSQ): The situational judgment test based inventory includes 15 vignettes that capture problems encountered in general business-related situations, such as managing tedious tasks or handling a competitive work situation. Each situation is accompanied by written options for how one might handle the situation. Respondents rate each option on its quality for resolving the problem using a scale from one (extremely bad) to seven (extremely good) with four being considered the middle value. The internal-consistency reliability of a scale was

determined using Cronbach's alpha (r=.93, n=377, p< 0.001) (Sternberg & Rainbow Project Collaborators, 2006). Criterion related validity has been established through analysis examining the relation between the CSQ and workplace performance showing a significant relation between the CSQ and supervisor ratings (r=.39, n=288, p< 0.01) (Cianciolo, et al., 2006). As was done with the Inventory, to better interpret individual responses to the problem scenario, aggregated variables were computed for each subject's response option ratings that reflected mean scores for the Worse options (ratings less than four) and for the Better options (ratings more than four) for each scenario. From those variables, overall Better and Worse means were computed, as well. Cronbach's alpha showed acceptable reliabilities, (Better, r=.80, n=13, p<.05; Worse, r=.91, n=15, p<.05).

Scoring Situational Judgment Tests: Various methods have been used to score the situational judgment test based tacit knowledge inventories, which included Consensus Based Assessment (CBA) and Mahalanobis distance (D^2) (Sternberg & Rainbow Project Collaborators, 2006; Pretz, 2008; Psotka, Legree, & Gray, 2007; Legree, Psotka, Tremble, & Bourne, 2005). For CBA scores, a higher score reflects greater tacit knowledge (Hedlund, Sternberg, & Psotka, 2000). D^2 scores show how far from the average expert rating and individual's score is. For this research D^2 and CBA scores were computed for both the CSQ and the Inventory Better and Worse choice aggregates.

Sternberg Triarchic Abilities Test-Practical Intelligence (STAT-PI): The STAT-PI "assesses the application of knowledge to solving common practical problems in three different content areas: quantitative, verbal, and figural" (Cianciolo, et al., 2006), with the score being calculated based on the number of problems in each content area answered correctly. Cronbach's alpha estimates of reliability are satisfactory but not high (r=.56, n=1013, p< 0.05), in part because the subtests are short (Sternberg & Rainbow Project Collaborators, 2006). Criterion related validity has been established with the STAT-PI being correlated with the Wonderlic Personnel Test, (r=0.45, n=150, p < 0.001) (Koke & Vernon, 2003). The data from the project discussed herein shows a significant correlation between the STAT-PI and CSQ Total Better scores ($r(22)$ = .531, p< 0.05).

Van der Heijden Measure of Professional Expertise (MOE): The measure consists of five scales designed to operationalize professional expertise that can be adapted to a specific profession. The Knowledge dimension (17 items) measures declarative, procedural and conditional knowledge. The Meta-cognitive dimension (15 items) measures one's knowledge of individual performance strengths and weaknesses, what knowledge and skills are lacking, and how to compensate for it. The Skill Requirement dimension (12 items) measures one's capacity to perform qualitatively well in one's domain of expertise. The Social Recognition dimension (15 items) measures the degree to which one is acknowledged as skilled or as being an expert, based on the recognition he or she receives. The Growth and Flexibility dimension (19 items) measure one's capability of acquiring a high performance level in more than one area of expertise (van der Heijden, 2002). The instrument is designed to be given to both the employee as well as the employee's supervisor. Cronbach's alpha reliabilities for each scale are acceptable: (Knowledge, r=.83(employee), r=.93(supervisor); Meta-cognition, r=.86(employee), r=.94(supervisor); Skill, r=.84(employee), r=.94(supervisor); social recognition, r=.83(employee), r=.94(supervisor); Growth and flexibility, r=.87(employee); r=.93(supervisor) were adequate (van der Heijden, 2000). For the present research, three scales (Meta-Cognition, Skill Requirement, and Social Recognition) were used. Data collection was limited to these three scales because of the amount of time officers had at their home agency, post graduation. Cronbach's alpha reliabilities based on current sample data (Meta-cognition, r=.91(employee), r=.91(supervisor); Skills, r=.86(employee), r=.95(supervisor); Social Recognition, r=.97(employee), r=.98(supervisor) were adequate.

Results

To establish the criterion validity of the Inventory, correlation and regression analyses were done to explore the relation between the CSQ, the STAT-PI, and the Inventory. Pearson Product Moment Correlation analysis was conducted to examine relations between the Better and Worse aggregates for the Inventory and CSQ D^2 and CBA scores, and the STAT-PI test scores. Table 1 summarizes the results of this analysis. Recalling that D^2 scores represent how far away a respondent's score is from the average and that CBA scores represent how much one's scores correlate with the average, discriminant validity is suggested here in the negative correlation pattern between the D^2 scores and the CBA scores. The positive correlation between the CSQ CBA scores and the STAT-PI test scores provides corroborating evidence of construct validity of the Sternberg measures (Sternberg & Rainbow Collaborators, 2006). Further, the correlation pattern between the Inventory domain-specific situational judgment test and the CSQ non-domain specific situational judgment test suggests a consistent response pattern in the thought processes associated with problem solving approaches among the respondents.

[Insert Table 1 near here].

Multiple linear regression analysis was conducted to determine which variables predicted the Inventory Better and Worse aggregated response options. For the Inventory Better and Worse variables, the CSQ Better and Worse aggregated variables and the STAT-PI test scores for each subject were entered into a stepwise analysis. For the Inventory Better variable, a significant regression equation was found ($F(2,29)=19.444$, $p < 0.01$), with an R^2 of 0.57, with CSQ Better and Worse aggregated variables being significant predictors. For the Inventory Worse variable a significant regression equation was found ($F(2,29)=9.484$, $p < 0.01$), with an R^2 of 0.40 with CSQ Better and Worse variables being the significant predictors.

Finally, to assess whether novice patrol officers differed from experienced officers in how they responded to Inventory items, an independent samples *t*-test was conducted comparing their CBA scores. Results were significant, $t(68)=-2.384$, $p<.05$ for the Inventory Better choice aggregate scores.

These results show that subject responses on the Inventory correlate with the previously validated CSQ, and that how one responds on the CSQ predicts how one will respond on the Inventory. The results also show that novice patrol and experienced officers differ on how they respond to the scenario options.

In the next phase of the project, selected POST basic Patrol Academy attendees were provided an opportunity to complete the Inventory. Tables 2 and 3 show means and standard deviations for the Inventory Better and Worse choice aggregates, the CSQ Better and Worse choice aggregates and the STAT-PI, respectively.

[Insert Table 2 near here]

[Insert Table 3 near here]

In the last phase of the project, the MOE was administered to POST basic Patrol Academy graduates and their supervisors at their home agency approximately six months after graduation. Table 4 shows Self and Supervisor mean ratings and standard deviations for the MOE.

[Insert Table 4 near here]

Simple linear regression analysis was conducted to examine if Inventory scores were predictive of Expertise scores. Results show that the Inventory Total Better raw scores significantly predict the MOE overall score, $F(1,22) = 6.77$, $p < .05$, $R^2=0.24$. Pearson Product Moment Correlation analysis was conducted to examine the relation between the Inventory Better and Worse choice D^2 and CBA scores and the MOE Supervisor rating scores. Table 5 summarizes the results of this analysis.

[Insert Table 5 near here]

In examining the pattern of Inventory response choices and the Supervisor ratings in Table 5, results suggest that the farther the responses of a novice officer are from the average aggregated response ratings, the higher they are rated by their Supervisor, or, conversely, the lower the novice officer's responses correlate with the average, the higher they are rated by their supervisor. Referring back to Table 2, in examining the Inventory D^2 scores for the expert officers, interesting to note is that compared to the novice patrol officer means, the Inventory D^2 Better response expert means were higher, and for both the Inventory CBA Better and Worse aggregates, the average correlations were lower than the novice patrol officer average CBA correlations. This suggests a corroborating response pattern among expert officers that emphasizes that the farther away one is from the average response, the more their scores are in line with what expert scores would be.

Discussion/Conclusion

The purpose of this research was to explore whether a learning tool comprised of knowledge gained on-the-job by experienced officers could accelerate the development of professional expertise among novice patrol officers in a measurable way. In the initial phase of the project, the goal was to create and validate the Inventory. To establish construct validity, the Inventory responses of the basic Patrol Academy attendees were compared to their responses on the two previously validated baseline measures (CSQ and STAT-PI). Pearson Product Moment Correlation Coefficient analysis results show significant correlational relations between the Inventory and the CSQ. Furthermore, the results of the multiple linear regression analysis show that the pattern of responses among novice Patrol Officers on the CSQ are predictive of their responses on the Inventory. An independent samples *t*-test analysis shows there *is* a measurable difference between novice patrol officers and experienced officers in terms of the response option choices they make on the Inventory.

In examining the means and standard deviations for the Inventory Better and Worse scores, experienced officers varied with respect to their ratings across the Better and Worse choice options, but the variance was more pronounced for the Worse choice options. This is consistent with previous research that has found that experts are more unified in knowing what to do to solve a problem, but disagree more about what not to do (Narvaez, 2010; Taylor, 2007). This finding suggests that among the experienced officers, there is disagreement about the appropriateness of response option choices to solve the problem outlined in the scenario. Selection of problem response options has been shown to be related to situational context, experience level, and individual factors (Narvaez, 2010; Taylor, 2007). One possible explanation is that responses to a problem are highly context dependent, and in rating the response options, experienced officers could have been placing the scenario within the context of their own individual experiences (Hinds, Patterson, & Pfeffer, 2001; Eraut, 2000; Bedard & Chi 1992; Chi, Glaser & Farr, 1988). Another possibility is that the best option is dependent on the size of the agency and availability of backup. With respect to the results from the independent samples *t*-test, the response patterns of novice police officers to the situational judgment test problem scenarios do differ from the expert officers in an interesting way that is consistent with the results of the previous analysis wherein the farther away one is from the average response, the higher one was rated. Within the *t*-test means and standard deviations, the average CBA correlation for the experts is lower than the average CBA correlation for the novice officers, and one of the D^2 aggregates is higher (farther away from the average). Taken together, these results seem to suggest that an officer who is an effective problem solver would possess a repertoire of approaches to solving novel problems, as opposed to a 'standard' approach. It might be assumed that one would develop this repertoire of problem solving approaches as one gains experience, but this assumption may not be valid. Previous research has established that experience contributes to tacit knowledge useful in solving problems, but experience doesn't guarantee that this will happen.

Results from the last phase of this study showing significant correlation between the CSQ and Inventory situational judgment test scores and the MOE supervisor ratings, supplemented by the regression analysis, and are consistent with previous research that found situational judgment tests to be predictive of performance (Legree, Psotka, Bludau, & Gray, 2009; Hedlund, Wilt, Nebel, Ashford & Sternberg, 2006). These results suggest that problem-solving ability (as measured by the situational judgment tests) plays a role in police officer competency and effectiveness. In examining the correlation coefficients for the CBA, D^2, and Expertise scores for the novice patrol officers, analysis shows that the further one's response is away from the average, the higher one is rated by their supervisor. One interpretation of these findings is that officers who approach a problem and are willing to explore a variety of response options may be considered more effective. As the problem oriented policing philosophy expands, it seems logical to suggest that more emphasis could be placed on cultivating a police force of skilled problem solvers. This happens in two ways: 1) screen applicants for problem solving ability; and 2) focus professional training to develop better problem solvers.

The main limitation of this study is the small sample size, thus, while phase one analyses were statistically significant, results should be interpreted cautiously, and a fair definition of this research should include the term exploratory. That being said, the implications of the research results described herein that could serve the police profession in the following ways:

One possible application of the Inventory would be its use as a screening tool for applicants to assess basic problem solving ability. Another use might be to incorporate it into a POST basic Patrol Academy application process as a knowledge assessment measure to establish baseline professional problem solving ability. Academy faculty could use this preliminary assessment to structure simulation scenarios and after action review discussion.

While this research takes place in the United States, the implications, arguably, are global. In any country, basic policing involves interacting with people and solving problems, with different contexts shaped by cultural diversity. Also, if a country's police force is shaped from within, as is customary in the United States, where an applicant starts in basic policing jobs and then works his or her way up into more technically oriented positions, then the cultivation of good problem solving skills can only increase one's professional potential.

To be an effective learning tool, the Inventory must be a valid measure of the experience-based knowledge of expert officers and should also be a valid measure of practical intelligence which has been shown to be predictive of problem solving ability and performance. As a learning tool, the Inventory shows potential for police officer basic training and possible applications include integration into the training curriculum, as discussed in this paper, or as a pre-training learning assessment. Recommendations for further research include replicating this study with a larger sample of basic patrol academy attendees as well as exploring the potential usefulness of tacit knowledge inventories for other police specialties.

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Figure 1. Sample Police Officer Tacit Knowledge Inventory Scenario

Scenario #5: TEENAGER WITH A WEAPON NEAR A SCHOOL	
You are dispatched to a call that there is a 16-year old with a gun running through an elementary school playground and that shots have been fired. What is the best response?	
***Rate each response below using the following scale:* 1=Extremely Bad; 2=Very Bad; 3=Somewhat Bad; 4=Neither Bad Nor Good; 5=Somewhat Good; 6=Very Good; 7=Extremely Good**	
	1. Focus only on getting to the school.
	2. Pull over, pull out your map book, and identify the major intersections in a 1-square mile grid. Call for other officers to block the intersections to form a perimeter.
	3. Pull out your map book and find the nearest major intersection and go there.
	4. Visualize and anticipate what actions police might take to form a circle of response.
	5. Think through options of response in anticipation of crises like these.
	6. Communicate with other responding officers to coordinate actions.

Table 1. Inter-Item Correlations Among Police Officer Tacit Knowledge Inventory (PO-TKI), Common Sense Questionnaire (CSQ) and Sternberg Practical Intelligence Test (STAT-PI) Raw, and Better/Worse Aggregated D^2 and CBA Scores

Measure	PO-TKI D^2 Total Better	PO-TKI D^2 Total Worse	CSQ D^2 Total Better	CSQ D^2 Total Worse	CSQ CBA Total Better	CSQ CBA Total Worse
PO-TKI D^2 Total Worse	.788** n=22 p=.000					
PO-TKI CBA Total Worse		-.450* n=22 P=.036				
CSQ D^2 Total Worse	.751** n=22 p=.000	.683** n=22 p=.000				
CSQ CBA Total Better	-.497* n=22 p=.019		-.514** n=46 p=.000	-.387** n=46 p=.008		
CSQ CBA Total Worse	-.477 n=22 p=.025	-.386** n=46 p=.008	-.512** n=46 p=.000	-.386** n=46 p=.008	.998** n=46 p=.000	
STAT-PI					.356* n=45 p=.016	.339* n=45 p=.023

Table 2. Novice Patrol and Expert Officer Means and Standard Deviations: Police Officer Tacit Knowledge Inventory (PO-TKI) Better and Worse Choice Raw Score, D^2, and CBA Aggregates

	Novice Patrol Officer			Expert Officer		
Measure	n	Mean	Standard Deviation	n	Mean	Standard Deviation
Total Better	22	5.45	0.3228	48	5.86	0.4001
Total Worse	22	2.82	0.3707	48	2.74	0.4471
D^2 Total Better	22	.81434	1.3314	48	1.0642	1.3857
D^2 Total Worse	22	.83367	1.7967	48	1.0554	1.7461
CBA Total Better	22	.4345	0.1069	48	.3567	1.3356
CBA Total Worse	22	.4695	0.1502	48	.4395	1.5570

Table 3. Novice Patrol Officer Means and Standard Deviations: Common Sense Questionnaire (CSQ) and Sternberg Practical Intelligence Test (STAT-PI) Raw Score, D^2, and CBA Better and Worse Choice Aggregates

Measure	n	Mean	Standard Deviation
Total Better	46	5.96	0.4586
Total Worse	46	2.52	0.4713
D^2 Total Better	46	.9783	1.0679
D^2 Total Worse	46	.9783	1.3451
CBA Total Better	46	.8422	0.0476
CBA Total Worse	46	.8420	0.0479
STAT-PI	45	11.27	2.3393

Table 4. Novice Patrol Officer Self- and Supervisor-Ratings Measure of Expertise Means and Standard Deviations by Dimension

Measure	n	Mean	Standard Deviation
Self-Rated Meta-cognitive Total	29	3.83	0.848
Self-Rated Skills Total	29	3.94	0.851
Self-Rated Performance Total	27	3.37	1.079
Self-Rated Overall Total	30	3.74	0.811
Supervisor-Rated Meta-cognitive Total	29	3.67	0.873
Supervisor-Rated Skills Total	29	3.70	1.007
Supervisor-Rated Performance Total	27	3.37	1.079
Supervisor-Rated Overall Total	29	3.59	0.948

Table 5. Results of Correlation Analysis Among Measure of Expertise (MOE) Supervisor Ratings and Inventory (PO-TKI)/Common Sense Questionnaire (CSQ) Better and Worse Aggregate D^2 and CBA Scores

Measure	MOE Supervisor Total		MOE Supervisor Meta-cognitive Total		MOE Supervisor Skills Total		MOE Supervisor Performance Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	3.59	0.948	3.67	0.873	3.70	1.007	3.37	1.079
PO-TKI D^2 Total Worse Mean: .83367 S.D.: 1.7967	.660** *p*=.007 n=15		.588* *p*=.021 n=15				.580* *p*=.038 n=13	
PO-TKI CBA Total Worse Mean: .4695 S.D.: 0.1502			-.560** *p*=.030 n=15		.657* *p*=.008 n=15			
CSQ D^2 Total Better Mean: .9783 S.D.: 1.0679							.423* *p*=.028 n=27	

Note: *p<.05; **p<.01