The IACP Research Advisory Committee is proud to offer the monthly Research in Brief column. This column features evidence-based research summaries that highlight actionable recommendations for *Police Chief* magazine readers to consider within their own agencies. The goal of the column is to feature research that is innovative, credible, and relevant to a diverse law enforcement audience.

The ABCs of Unintentional Discharges

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Prevention of the unintentional discharge (UD) of firearms is a goal that all law enforcement agencies strive toward. A UD is an "activation of the trigger mechanism that results in an unplanned discharge that is outside of the firearm's prescribed use."[1]

An operational definition is paramount to an empirical analysis. This definition encompasses, without attribution of blame, events that result from the complacent handling of a firearm (often referred to as accidental or negligent discharges), those associated with involuntary muscle contractions, and discharges that result from compromised structural integrity of the firearm.[2] Often, one looks to the officer's behavior or the firearm design to assign fault. However, it has been proposed that a wide variety of other contextual factors might influence the occurrence of UDs (e.g., stress, fatigue, training, drugs, attention, and firearm design).[3] While appreciated as pioneering work in the understanding of UDs, there has been a reliance on theoretical generalizations and anecdotal evidence to support these claims. Information gleaned from an empirical analysis, one that can be verified through direct observation, can lead to a more complete and clear understanding of the issue.

In an attempt to further identify conditions under which UDs might occur, the authors developed a standardized method for categorizing the events. Reports were studied using techniques regularly employed by practitioners of applied behavior analysis. An antecedent-behavior-consequence (ABC) approach identified the specific conditions associated with each UD. An *antecedent* is an event, action, or context that precedes and sets the occasion for a behavior (e.g., cleaning a firearm); a *behavior* is an observable, measurable action (e.g., flexion of the finger muscles); and a *consequence* is an event that follows the behavior (e.g., activation of the trigger mechanism and firearm discharge). By using this approach, the factors commonly associated with UDs in practice can be identified.

Present Study

The primary purpose of the study was to validate the research team's prior work on 137 reports and to strengthen the empirical literature with a novel sample. In the new study, a total of 171 pre-existing (1992–2016) official reports were analyzed using the procedures outlined in the previous research.[4] Reports were obtained from three law enforcement agencies in the United States and from one non-U.S. agency. All agencies provided approval for the confidential analysis and publication of the data contained in the reports.

Results

In total, 46 models (e.g., semi-auto pistols, revolvers, rifles, and shotguns) from 16 different firearm manufacturers were reported, including a substantial sample (28 percent) of semi-auto pistols with double-action–only trigger mechanisms. Interestingly, the results from this study complement many of the findings reported previously. This finding provides additional support for the notion that UDs can and do occur across a wide variety of firearms, regardless of design, trigger mechanism, or trigger poundage. Routine tasks were again associated with the largest number of UDs, followed by muscle co-activations, unfamiliar tasks, and contact with objects, respectively. A noteworthy finding from the present study was that 4 percent of reports provided evidence of a startle response across multiple modalities (i.e., auditory, somatosensory, and visual stimuli). This is the first documented empirical evidence of startle-induced UDs since researcher Dr. Roger Enoka formally introduced the idea in 2003.[5] In fact, the present study even found evidence of a double UD: the report involved a muscle co-activation on the part of one officer and a startle response of another. Partner officers were responding to a call, during which the first officer jumped over a ditch, lost his or her balance, fell, and unintentionally discharged his or her shotgun. Nearby, the officer's partner was holding a rifle, was startled by the unexpected blast, and unintentionally discharged his or her rifle, as well. Miraculously, no one was injured.

However, injuries were more common in this study's sample than in previous ones and occurred in 20 percent of reports. Individuals injured included the officer (75 percent), a fellow officer (13 percent), or a suspect (13 percent). Within the reports that resulted in injuries, officer behaviors included routine firearm tasks (48 percent); muscle co-activation (16 percent); contact with an object: inanimate, animate, or officer apparel (14 percent); not otherwise specified (11 percent); unfamiliar tasks such as transferring the firearm between hands (7 percent); and a startle response (5 percent). Deaths were also more common in the present sample and occurred in 8 percent of reports, including the death of suspects (85 percent) or fellow officers (15 percent). Within the cases that resulted in deaths, muscle co-activation was associated with the vast majority of reports (80 percent) with the remaining cases not otherwise specified. These findings suggest that injuries and deaths may be more prevalent than previously reported and might be more likely to result from involuntary muscle contractions, as compared to other officer behaviors.

Action Items and Recommendations

Regularly updated information will aid in the design of proactive firearms safety training, as well as retraining and re-qualification procedures to

prevent UDs. In addition, a centralized repository for confidential reports will greatly improve the field's understanding of the conditions under which UDs are likely to occur, thus guiding efforts to reduce these incidents and improve officer safety. ❖

For an in-depth analysis of the study's results, see John O'Neill, Mark E. Hartman, Dawn A. O'Neill, and William J. Lewinski, "Further Analysis of the Unintentional Discharge of Firearms in Law Enforcement," *Applied Ergonomics* 68 (2018): 267–272.

Notes:

[1]John O'Neill, Dawn A. O'Neill, and William J. Lewinski, "A Behavior Analysis of Unintentional Discharges," *The Police Chief* 83, no. 11 (November 2016): 14–15, citing John O'Neill, Dawn A. O'Neill, and William J. Lewinski, "Toward a Taxonomy of the Unintentional Discharge of Firearms in Law Enforcement," *Applied Ergonomics* 59 (2017): 283–292.

[2]Roger M. Enoka, "Involuntary Muscle Contractions and the Unintentional Discharge of a Firearm," *Law Enforcement Executive Forum* 3, no. 2 (2003): 27–39.

[3]Hal W. Hendrick, Paul Paradis, and Richard J. Hornick, "Human Factors Causes of Unintentional Shootings," in *Human Factors Issues in Handgun Safety and Forensics* (Boca Raton, FL: Taylor & Francis Group, 2008), 15–30.

[4]O'Neill, O'Neill, and Lewinski, "A Behavior Analysis of Unintentional Discharges."

[5]Enoka, "Involuntary Muscle Contractions and the Unintentional Discharge of a Firearm."

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