Scripting Police Escalation of Use of Force through Conjunctive Analysis of Body-Worn Camera Footage: A Systematic Social Observational Pilot Study

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Purpose: To date script analysis has not been used in the field of criminology to further understand processes behind events involving non-offending criminal justice system actors. The purpose of this research is to conduct a pilot study to develop a police officer force escalation script.
Methods: Through the systematic social observation video data analysis of police-worn body camera footage, conjunctive analysis of case configurations is applied to develop force escalation scripts.
Results: Scripts consist of dominant officer and subject action configurations associated with an increased risk of escalation from soft empty-hand control to more severe types of force, as well as configurations of environmental and demographic characteristics.
Conclusions: Based on identified scripts, if study results are replicated using a larger sample size, results support the efficacy of persistent calm commands for reducing risk of escalation. Crisis intervention and procedural justice training is recommended for officers. To create a heightened awareness of the presence of a recording device, wearers of BWCs may consider narrating interactions as they unfold. Finally, pending replication, we advocate for immediate physical separation of victim and suspect when in a private space.

Keywords: use of force; body-worn cameras; script analysis; conjunctive analysis of case configurations; systematic social observation

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Introduction

Script analysis has become a popular method of identifying and articulating situational processes in the field of criminology (Dehghanniri & Borrion, 2019). Owing to its roots in situational crime prevention (Clarke & Cornish, 1985; Cornish, 1994a; 1994b), script analysis overwhelmingly favors the mapping of crime events over other event types within the criminal justice system. Script analysis provides an exciting avenue for analyzing criminal justice procedures at the situational level. Recent survey research points to police officer use of force as an event type of significant concern for criminologists, criminal justice practitioners, and the public (see Davis, Whyde, and Langton, 2018). Such negative experiences with police have implications for perceptions of police legitimacy and crime control (Brunson, 2007; Rosenbaum et al., 2005; Kirk & Papachristos, 2011).

Using Ekblom and Gill's (2016) factors linking actor 'performance' to situational prevention as a framework in a combined functional and causal scripting approach, the present exploratory study uses scripting to describe a series of varying dominant configurations of choice-structuring properties (see Cornish & Clarke, 1987) related to escalation of police use of force. We rely on systematic social observation and video data analysis of police use of force cases captured on police body-worn cameras to identify actions and environmental characteristics present during the use of force event (Reiss, 1968; 1971; Nassauer & Legewie, 2018; Glaser, 2016). Additionally, we incorporate arrest data to identify individual characteristics of involved parties. Upon identifying factors linking actor performance to situational prevention, we use conjunctive analysis of case configurations (Miethe, Hart, and Regoeczi, 2008) to identify dominant case configurations of police officer and suspect actions and demographic characteristics, as well as common case configurations of environmental

characteristics. We further determine the relative risk of use of force escalation from soft empty-hand force to more severe forms of force by case configuration. Drawing on study findings, we discuss situational prevention strategies and policy recommendations related to escalation of police use of force that may be considered pending replication of results.

Review of the Relevant Literature

Script analysis and non-offending criminal justice system actors

Script analysis was first used in cognitive science to frame how humans process frequently experienced events (see Abelson, 1976; Schank & Abelson, 1977). As Ekblom and Gill (2016) argue, scripting in criminology has taken on the opposite goal from that of cognitive science. Instead of mapping how humans complete complex tasks without having to actively choose to do so, script analysis in criminology aims to model decision-making processes. The utility of articulating the situational processes of a criminal event is rooted in *rational choice perspective* and *situational crime prevention* (SCP). Rational choice perspective suggests we set various objectives throughout our daily lives, and in determining how to meet such objectives, weigh the costs and benefits associated with each available option for achieving a goal. In the case of criminal activity, Cornish and Clarke (1987) posited that decisions to offend are crime-specific and are the product of the interaction between characteristics of offence and of offender. Clarke (1983) described SCP as measures meant to reduce opportunities for crime, and increase the risks associated with committing crime.

Due to criminological scripting's SCP roots, script analysis overwhelmingly favors the mapping of crime events to "identify the necessary and sufficient requirements" and inform crime control strategies (Cornish, 1994a, p. 39; see also Leclerc and Wortley, 2014). A recent systematic review by Dehghanniri and Borrion (2019) identified 105 original scripts on a variety

of crime types, including cybercrime, corruption, drug-related offences and many more. Leclerc and Reynald (2015) applied script analysis to the intervention of capable guardians in public settings, but beyond this study, script analysis has yet to be comprehensively exploited to empirically map events directed by non-offending criminal justice system actors. Given the present sense of urgency around criminal justice reform, to inform situational strategies researchers must expand script analysis beyond the mapping of the criminal event to include events directed by non-offending criminal justice system actors.

Situational factors influencing use of force

The U.S. Bureau of Justice Statistics' Police-Public Contact Survey found that 2% of the 53.5 million persons (~1 million people) who had contact with police over a 12-month period experienced use of force or threat of use of force; when asked about the most recent contact with police, the number increases to 3% (Davis et al., 2018). Of those who experienced pushing, grabbing, hitting, or kicking during their most recent contact with police, 78% believed the action to be excessive (Davis, et al., 2018). Negative experiences with police, even indirect experiences, carry the implication of erosion of perceptions of legitimacy (Brunson, 2007; Rosenbaum et al., 2005). When the public views agents of the law unfavorably, the ability of such agents to maintain social order is severely compromised (Sampson & Bartusch, 1998; Kirk & Matsuda, 2011; Kirk & Papachristos, 2011).

Contemporaneous to the social implications of unnecessary or excessive force, many police agencies in the United States have policy mandating officers use verbalization for the purpose of de-escalation prior to using force, and apply force as an escalating series of actions when necessary (National Institute of Justice, 2008). For example, as a result of a 2011 U.S. Department of Justice Civil Rights Division investigation into the Newark, NJ Police Division

(NPD), the NPD entered into a federal consent decree requiring the adoption of a wide range of reforms, such as an updated use of force policy (U.S. Department of Justice Civil Rights Division, 2014; U.S. v. City of Newark, 2016, p. 1; Newark Police Division, 2018, p. 2). Activities described by this policy include providing subjects with a reason for their arrest prior to using force, de-escalation of the situation through verbal commands and information gathering, and recognizing that officer demeanor can influence escalation (Newark Police Division, 2018, p. 14). As with traditional crime scripting, if processes of police officer use of force are identified, such characteristics can inform situational prevention by identifying configurations of officer actions most related to the escalation of force.

Extant literature points to various situational factors that impact officers' decisions to use force when interacting with citizens. For example, suspect resistance (Alpert &Dunham, 1997; Bolger, 2013; MacDonald et al., 2003), number of officers on scene (Terrill, 2005), incidents involving citizens with mental health issues or intoxication (Rossler & Terrill, 2017; Lawton, 2007), and officer discretion regarding activation of body worn cameras (Malm, 2019) can all increase the likelihood of use of force. Beginning with the seminal work of Toch (1969), researchers have identified officer-citizen interactions as a transactional exchange of suspect and officer behaviour. The series and ordering of events can largely determine whether force occurs (Binder and Scharf, 1980; Terrill, 2005). As noted by White (2016), a full understanding of both police and citizen violence can potentially reduce unnecessary violence by both parties.

Scripting choice-structuring properties

Crime scripts organize crime events into sequential stages leading to a specifiable goal (Holt & Lee, 2020: Keatley, Mcgurk, & Allely, 2020; Brayley, Cockbain, & Laycock, 2011; Chiu, Leclerc, & Townsley, 2011; Leclerc, Wortley, & Smallbone, 2011). Ekblom and Gill (2016)

refer to this type of script as a *procedural script* which provides a *functional explanation*. Procedural, functional explanation scripts can contribute to SCP strategies by informing crime commission sequence manipulation, or "pinch points" for which environmental manipulation is not possible (Cornish, 1994b; Ekblom & Gill, 2016). An example of such a SCP strategy can be found in Sytsma and Piza's (2018) presentation of an open-air drug market script. The authors identified the time-period following the drug transaction as an optimal law enforcement intervention point given that drug sellers commonly maintained their anchor point within the drug market after a drug sale. With that said, Cornish (1994b, p. 171) draws on Abelson (1981) in the assertion that crime scripts are not rigidly organized scenes. Individual circumstances and situational factors can influence scripts to modify and adapt. According to Cornish (1994b, p. 172), "the routinization which develops will be complex and able to handle multiple contingencies."

In advocating broadening criminological script analysis beyond those that model sequential stages leading to a specifiable goal, Ekblom and Gill (2016, p. 323) present an expanded definition of scripting which includes articulation of subject actions, targets of such actions, as well as "totality of the relevant environment, situation or setting." In contrast to procedural, functional explanation scripts, Ekblom and Gill (2016) advocate for combining functional perspectives with causal perspectives to identify both actions, as well as psychological, ecological, and situational contributors to behavior. Additionally, in Clarke and Cornish's 1985 essay on modeling offender decisions, they emphasize that because the goal of script development is generally SCP, event modeling need not be complete and thorough, but rather must only provide enough description to inform crime prevention policy and further empirical inquiry. As such, scripts or other such 'templates' (see Brantingham and Brantingham,

1984) which include *choice-structuring properties* (see Cornish & Clarke, 1987) such as locations, props, cast, roles, and actions can make a useful contribution to SCP strategy development.

The present study builds upon scripting of crime event sequences and capitalizes on Ekblom and Gill's (2016) broad definition of script analysis to explore a series of varying dominant configurations of choice-structuring properties related to escalation of police use of force. Such properties include police officer and suspect action points, and environmental and individual characteristics. By presenting variants of the force escalation script, we account for the "multiple contingencies" inherent in the "routinization" of complex events (see Cornish, 1994b, p. 172).

Using conjunctive analysis for functional, causal scripting

In Ekblom and Gill's (2016) discussion of functional and causal approaches to script development, the authors point out factors linking actor 'performance' (or action) to situational prevention. Those factors relevant to the present study include *perception of opportunity*, *awareness space* (borrowed from Brantingham and Brantingham (1993)), and *precipitators* (see also Wortley, 2008). For the remainder of this article we will refer to factors linking actor performance to situational prevention as *performance-prevention linking constructs*. Perception of opportunity refers to potential for variability in assessment of opportunity and can include both indicators of opportunity and moderating conditions that reduce or protect against opportunity. In a use of force event, indicators of police officer *perception of opportunity* for force escalation might include suspect verbal or physical antagonism, weapon possession or attempts by the suspect to flee the scene (Alpert, Dunham, & MacDonald, 2004; Garner,

Maxwell, Heraux, 2006; Terrill, 2003, 2005). An action such as explaining to a suspect why they are being detained may protect against opportunity for escalating use of force.

For police officers, training, experience, and institutional culture influence actions and reactions in a variety of settings or *awareness spaces* (Wood, Tyler, & Papachristos, 2020; Dror, 2007; Paoline and Terrill, 2007; Terrill, Paoline, & Manning, 2003). Public spaces prompt actions that differ from those in private spaces and other setting factors can influence police officer actions as well (Sherman, 1980; Alpert and Smith, 1994). For example, the presence of various types of bystanders in a public space may influence performance (Garner et al., 2006). *Precipitators* are factors that can provoke a reaction, such as a suspect triggering anger in a police officer through verbal antagonism. Consideration of these performance-prevention linking constructs add complexity to the scripting process. However, conjunctive analysis of case configurations provides an avenue for combining functional and causal approaches to scripting, and account for multiple contingencies in a manner conducive to developing situational prevention strategies for police officer escalation of use of force.

Conjunctive analysis of case configurations (CACC) can be described as a multivariate technique for the analysis of categorical variables which allows for the establishment of causal relationships (Miethe, Hart, & Regoeczi, 2008; Bryant, Townsley, & Leclerc, 2014). Once predictors of a given outcome are selected, the purpose of CACC is threefold: 1. to identify all possible combinations of predictor variable attributes; 2. determine how cases are distributed among attribute combinations; 3. explore "the relative distribution of particular categories of the outcome variable across these configurations" (Miethe et al., 2008, p. 229).

Bryant et al. (2014, p. 75) refer to CACC as "case-oriented rather than variable-oriented." Each observation is considered based on combinations of contexts. Results are presented in a

matrix or *truth table* (Hart, 2020). From a truth table the researcher can extract *dominant* case configurations or profiles. A configuration is considered dominant if it meets a pre-determined threshold criterion for the number of cases that share the same configuration (Hart, 2020). Thresholds are determined based on sample sizes or other practical considerations unique to one's research purposes. For example, in their study of 364 offenders Doherty and Cwick (2016) relied on a threshold criterion of ≥5, meaning a configuration was considered dominant if observed in 5 or more cases. Studies with larger sample sizes (e.g. ≥ 3000) have applied the more stringent threshold of ≥10 (see Rennison, Dragiewicz, and DeKeseredy, 2013).

CACC has been used to study a variety of criminal justice-related topics (see Miethe et al., 2008; Doherty and Cwick, 2016; Shaffer and Miethe, 2011; DeLeeuw and Pridemore, 2018; and Gruenewald et al., 2019). CACC has specifically been employed to identify combinations of environmental and situational factors for the purpose of developing SCP strategies, and many such studies fit Ekblom and Gill's (2016) expanded definition of script analysis. For instance, Miethe and Sousa (2010) explored the situational context of carjacking incidents; Rennison et al. (2013) explored the situational context of reporting to police instances of violence against women; Bryant et al. (2014) explored protective measures at the situational level during maritime piracy events; and Hart and Miethe (2015) identified the environmental characteristics of robbery locations.

Scope of the Current Study

The current study is the outgrowth of an applied partnership between the authors and the NPD. NPD is the largest police agency in New Jersey, employing 1,155 sworn police officers in 2018 (the final year of the current study period).[1] The City of Newark exhibited a Part 1 crime rate of

[1] See https://ucr.fbi.gov/crime-in-the-u.s/2018/crime-in-the-u.s.-2018/tables/table-78/table-78-state-cuts/new-jersey.xls

2,743 per 100,000 residents in 2018, the ninth highest of New Jersey municipalities with at least 50,000 residents.[2] Racial minorities account for the majority of the population with 26.1% of residents identifying as White-alone. Newark has a poverty rate of 28% as compared to 9.2% statewide.[3]

As mentioned prior, the NPD entered into a federal consent decree resulting from a Department of Justice Investigation finding the agency engaged in a pattern or practice of civil rights violations, particularly as it relates to officer use of physical force. The Department of Justice mandated the NPD enact several reforms to remedy this issue, including the deployment of BWCs, updating use of force policies, and de-escalation training. To better understand how police-citizen encounters unfolded within the context of these police reforms, the research team designed a systematic social observation (SSO) of BWC footage of police use of force events.

The purpose of the present exploratory study is fourfold:

1. Based on Ekblom and Gill's (2016) combined functional and causal scripting approach, identify action points and environmental characteristics present during use of force events which are indicative of performance-prevention linking constructs (*perception of opportunity*, *awareness space*, and *precipitators*).
2. Identify how cases are distributed among dominant configurations of action point, and environmental and individual characteristic indicators.
3. Determine the relative risk of use of force escalation from soft empty-hand force to more severe forms of force based on case configuration.
4. Draw on study findings to identify situational prevention strategies and policy recommendations which may be considered pending replication of results.

[2] https://ucr.fbi.gov/crime-in-the-u.s/2018/crime-in-the-u.s.-2018/tables/table-8/table-8-state-cuts/new-jersey.xls
[3] https://www.census.gov/quickfacts/fact/table/NJ,newarkcitynewjersey/PST045219

Methods

Design and sampling

The present study is a SSO video data analysis of police use of force cases captured on BWC by the NPD. SSO is a systematic method of data collection developed by Reiss (1968, 1971) wherein data collection is independent of the phenomena being observed. It has previously been used to study police-citizen interactions in-person through 'ride-alongs' with police (for example, see Todak and James, 2018). Video data analysis, involving the analysis of pre-existing video footage to uncover situational dynamics of human behavior, provides an innovative venue for SSO (Nassauer & Legewie, 2018). Further, Makin, Willits, and Brooks (2020) demonstrate that BWC footage enables researchers to contextualize outcomes of police-citizen encounters, and such a data source has been used previously by these authors to identify the duration of police use of physical force, among other outcomes (Willits & Makin, 2018).

The sample for this exploratory study consists of 91 use of force events recorded by BWCs between December 2017 through the end of 2018.[4] The unit of analysis is *use of force events* which includes at least one instance of police use of physical force. *Use of force events* include a period of time preceding and following the use of force incident(s), beginning when the officers are first visibly seen interacting with any involved parties (e.g., suspects, bystanders, or victims). The exception to this is cases for which the video footage begins after police had already begun interacting with involved parties. There are 36 such cases in this study. The end of

[4] The population is all 122 use of force events recorded by BWCs between December 2017 through the end of 2018. Of 122 cases, 18 were excluded because the use of force event was not actually captured by BWC. In these cases, the BWC-equipped officer(s) arrived on-scene after force had been applied. In 5 additional cases use of force occurred after arrest processing. Six cases were excluded either because the use of force constituted the application of handcuffs (n=3) or because the internal affairs unit was actively investigating the cases (n=3). Finally, a single incident was incorrectly tagged as two events in the BWC database.

the *use of force event* can be described as the time at which full suspect compliance is secured, making the likelihood of physical force minimal. This may include the period following an arrest, the time at which suspects were secured within a patrol car, or the time at which the officers left the scene.

Measurement and Analytical Framework

In coding variables during the SSO, we were informed by Nassauer & Legewie's (2018) analytical dimensions for video data analysis: 1) facial expressions and posture; 2) interactions; and 3) context. To gain an understanding of the nuances of police-citizen encounters, prior to coding the video footage we engaged in an in-depth review of the data during a five-day data retreat at NPD headquarters. Through this data retreat we determined interactions and context to be key analytical dimensions of police-citizen encounters. Interactions involve movement and actions, verbal communication, and gestures (i.e., nonverbal codes) amongst participants. Context involves physical dimensions (i.e., properties of the environment) and social dimensions (i.e., actors present, and their relationships and roles during a situation) (Nassauer & Legewie, 2018, p. 13-15). Further, using Ekblom and Gill's (2016) performance-prevention linking constructs as a framework, a review of the literature was completed to identify empirically derived situational predictors of use of force.[5] See Table 1 for a summary table of constructs, and associated situational predictors and sources. See APPENDIX A for a visual depiction of the workflow associated with the measurement, coding, and analytical procedures

Empirically derived situational predictors of use of force were coded for in the data, and further categorized by emergent classifications using an open-coding technique similar to that of

[5] It should be noted that for the purpose of this research, performance-prevention linking constructs are not mutually exclusive. For example, suspect possession of a weapon may be seen as an opportunity for an officer to escalate use of force, but it may also be a precipitator in that it evokes an emotional response in an officer.

Hutchings and Holt (2015). Open-coding is the process of attaching properties or labels to observations by segmenting data into meaningful groups (Glaser, 2016). Classifications include: officer action points, suspect actions points, and environmental characteristics. While these classifications emerged organically, they are consistent with Cornish and Clarke (1987), and Ekblom and Gill's (2016) emphasis on actions and ecology in SCP strategy development. Segmenting observations also provides a framework for analytical operations. This work is exploratory and possesses low statistical power (see Discussion section for presentation of prospective power analyses results). As such indicators could not simultaneously be included in one 'kitchen sink' configuration, thus necessitating several smaller models.

It took approximately 300 hours to review and code all use of force events. Due to technological limitations preventing coders from viewing the video footage remotely, a single coder was responsible for data collection and tests for intra-coder reliability were conducted.[6] Video data was supplemented by NPD arrest records to ascertain gender, ethnicity, and age of officers and suspects and these demographic characteristics were classified as either officer demographics or suspect demographics.

Six officer action points and 6 suspect action points within the use of force event were identified. Each are operationalized in a binary fashion indicating whether or not the action was explicitly confirmed to have occurred based on visual or verbal indications apparent to the coder. Officer action points include (1) *officer announcement of BWC*; (2) *officer offering suspect the reason as to why police responded to the scene*; (3) *officer explaining to suspect why the suspect was being detained*; (4) *officer displaying verbally antagonistic behavior*, such as shouting

[6] To test reliability, ten percent of cases were randomly selected and recoded six months after the original coding commenced. Kappa coefficients confirmed the reliability of all coding for this study, with all coefficients >0.06 (see see Landis & Koch, 1977). Given space constraints, reliability test findings are not presented in text but are available as supplemental materials.

berating phrases or name-calling; (5) *officer giving at least one calm command to suspect*; and (6) *officer giving at least one shouting command to suspect*. A *calm command* is a non-threatening, verbal command. Examples of a calm, non-threatening verbal command include, "Let me see your identification" and "Open your backpack". That said the focus is not on the words used, but on the tone with which the command is delivered. A *shout command* is an increased volume (i.e., yelling) command. Again, the focus is not on the words used, but on the tone with which the command is delivered. Suspect action points include (1) *evidence of drug or alcohol impairment*, such as audibly slurred speech, difficulty standing or walking, or verbal indications from bystanders; (2*) suspect attempting to speak for the purpose of expressing their views*; (3) *suspect displaying verbally antagonistic behavior*; (4) *suspect displaying physically antagonistic behavior*, such as pushing, punching, or kicking officers; (5) *suspect in possession of a weapon*; and (6) *suspect attempting to flee the scene*.

Six environmental characteristics were identified, and NPD arrest data was used to determine 6 officer and suspect demographic characteristics, each operationalized in a binary fashion. Environmental characteristics include (1) *daytime*; (2) *outdoors*; (3) *public space*; (4) *presence of the crime victim on scene*; (5) *presence of non-antagonistic bystander*; and (6) *presence of involved, antagonistic bystander*. *Daytime* is operationalized using the dichotomy nighttime/daytime and is conceptualized as the time at which darkness has not provided a cover. During daytime flashlights or other illuminating devices are not required by officers for the purpose of identifying suspects, bystanders, potential weapons, and the scene around them. *Outdoor* events can be contrasted to indoor events, and *public spaces* are those which are accessible to anyone. Examples include sidewalks, public parks, and common spaces in shopping areas. Private spaces in contrast include private residences, businesses, and apartment doorways

or hallways. *Bystanders* are those persons on scene observing the event. Persons in the area who are not observing the event, such as those moving through the area, are not considered bystanders. *Non-antagonistic bystanders* are those bystanders who are either uninvolved, neutral, or helpful. Uninvolved bystanders are those passively observing the event. Neutral or helpful bystanders are those involving themselves in the event by behaving in a helpful manner toward police or involving themselves in the event but behaving in a neutral manner toward police. Examples include persons providing officers information, such as impairment status of suspect, or information regarding a possible drug overdose related to the event. *Involved, antagonistic bystanders* are those involving themselves in the event by behaving in an aggressive or antagonistic manner towards police. Examples include holding cell phones close to officers faces or shouting berating phrases at officers. Demographic characteristics include (1) *suspect Black or Hispanic*; (2) *suspect male*; (3) *suspect age greater than median 29-years*; (4) *officer Black or Hispanic*; (5) *officer male*; (6) *officer age greater than median 29-years*. The median age of 29-years among the suspects in this study is the same as the median age among the officers.

Table 1. Performance-Prevention Linking Constructs and Associated Observed Indicators

Performance-Prevention Linking Construct	Observed Indicator
Perception of opportunity factors	• evidence of suspect drug or alcohol impairment (Garner et al., 2002; Terrill, 2005; Lawton, 2007) • officer announcement of BWC (moderator) (Wood et al., 2020) • officer offering suspect the reason as to why police responded to the scene (moderator) (Wood et al., 2020) • officer explaining to suspect why the suspect was being detained (moderator) (Wood et al., 2020) • officer giving at least one calm command to suspect (moderator) (Terrill, 2005) • suspect displaying physically antagonistic behavior (Garner et al., 2002; Bolger, 2015) • suspect in possession of a weapon (Garner et al., 2002) • suspect attempting to flee the scene (Bolger, 2015)
Awareness space factors	• time of day (Sherman, 1980) • setting (indoors/outdoors) (Sherman, 1980) • type of space (public space/private space) (Sherman, 1980) • presence of the crime victim on scene (Bolger, 2015) • presence of non-antagonistic bystander (Garner et al., 2002) • presence of involved, antagonistic bystander (Garner et al., 2002)
Precipitator factors	• officer displaying verbally antagonistic behavior (Garner et al., 2002; Wood et al., 2020) • officer giving at least one shouting command to suspect (Terrill, 2005) • evidence of suspect drug or alcohol impairment (Garner et al., 2002; Terrill, 2005; Lawton, 2007) • suspect attempting to speak for the purpose of expressing their views (Bolger, 2015) • suspect displaying verbally antagonistic behavior (Bolger, 2015) • suspect displaying physically antagonistic behavior (Garner et al., 2002; Bolger, 2015) • suspect in possession of a weapon (Garner et al., 2002) • suspect attempting to flee the scene (Bolger, 2015) • presence of the crime victim on scene (Bolger, 2015) • presence of non-antagonistic bystander (Garner et al., 2002) • presence of involved, antagonistic bystander (Garner et al., 2002)

Using the threshold criterion of ≥5 found in Doherty and Cwick (2016; see also Hart, 2020), CACC was used to identify dominant case configurations of police officer and suspect action points during the use of force event, as well as common case configurations of environmental characteristics and officer and suspect demographic variables. CACC was also

used to determine the relative risk of use of force escalation from soft empty-hand force to more severe forms of force based on case configuration. Following Miethe et al's (2008) operationalization of risk within the context of CACC, overall risk is presented as the percentage of total cases in which use of force escalation occurred, and relative risk is the percentage of cases within a configuration in which the outcome occurred. *Escalation of use of force* is operationalized in a binary fashion where the highest level of force used in the event is either soft empty-hand control (coded as 0) or force greater than soft empty-hand control (coded as 1). In 36.26% (n=33) of cases the highest level of force is soft empty-hand control and in 63.74% (n=58) of cases use of force escalated beyond soft empty-hand. In 50.55% (n=46) of cases the highest level of force used during the force event is hard, empty hand control. In 7.69% (n=7) of cases the highest level of force is threat of lethal force, and in 5.49% (n=5) of cases it is use of a chemical device (i.e., pepper spray). There are zero instances of either blunt object impact or deadly force.

Finally, Hart (2020) recently presented a method for goodness-of-fit testing for CACC truth tables, which was applied here. The null hypothesis in Hart's goodness-of-fit test posits that there is not more situational clustering than expected; thus, the number of cases per profile does not vary by context. In other words, a non-significant test indicates that the number of cases per profile does not depend on the items included in the profile. While the number of cases per profile is not important in a non-significant truth table, relative risk of outcome given a particular profile is. See Table 2 for descriptive statistics of all variables under study.

Table 2. Descriptive Statistics

Variables		Frequency	Percent
Outcome			
Escalation of use of force	Soft-hand control	33	36.26
	Greater than soft-hand control	58	63.74
	Total	91	100
Officer Action Points			
Announce presence of BWC	Unconfirmed	53	58.24
	Confirmed	38	41.76
	Total	91	100
Provide reason responding	Unconfirmed	63	69.23
	Confirmed	28	30.77
	Total	91	100
Explain why detained	Unconfirmed	52	57.14
	Confirmed	39	42.86
	Total	91	100
Verbally antagonistic	Unconfirmed	58	63.74
	Confirmed	33	36.26
	Total	91	100
Calm command	Unconfirmed	20	21.98
	Confirmed	71	78.02
	Total	91	100
Shout command	Unconfirmed	42	46.15
	Confirmed	49	53.85
	Total	91	100
Suspect Action Points			
Evidence drug/alcohol impairment	Unconfirmed	68	74.73
	Confirmed	23	25.27
	Total	91	100
Attempt express views	Unconfirmed	31	34.07
	Confirmed	60	65.93
	Total	91	100
Verbally antagonistic	Unconfirmed	43	47.25
	Confirmed	48	52.75
	Total	91	100
Physically antagonistic	Unconfirmed	55	60.44
	Confirmed	36	39.56
	Total	91	100
Weapon possession	Unconfirmed	74	81.32
	Confirmed	17	18.68
	Total	91	100
Attempted flee	Unconfirmed	59	64.84
	Confirmed	32	35.16
	Total	91	100

Table 2 Continued. Descriptive Statistics

Environmental Characteristics			
Daytime	Nighttime	56	61.54
	Daytime	35	38.46
	Total	91	100
Outdoors	Indoors	18	19.78
	Outdoors	73	80.22
	Total	91	100
Public space	Private space	19	20.88
	Public space	72	79.12
	Total	91	100
Victim on scene	Unconfirmed	62	68.13
	Confirmed	29	31.87
	Total	91	100
Non-antagonistic bystander	Unconfirmed	35	38.46
	Confirmed	56	61.64
	Total	91	100
Antagonistic bystander	Unconfirmed	65	71.43
	Confirmed	26	28.57
	Total	91	100
Demographic Characteristics			
Suspect ethnicity	White	3	3.30
	Black or Hispanic	88	96.70
	Total	91	100
Suspect sex	Female	18	19.78
	Male	73	80.22
	Total	91	100
Suspect age >29-years	Median age (29 years) and below	50	54.95
	Greater than median age	41	45.05
	Total	91	100
Officer ethnicity	White	25	27.47
	Black or Hispanic	66	72.53
	Total	91	100
Officer sex	Female	1	1.10
	Male	90	98.90
	Total	91	100
Officer age >29-years	Median age (29 years) and below	46	50.55
	Greater than median age	45	49.45
	Total	91	100

Results

Officer action points

Based on 6 action points, the total possible number of configurations is 64. Based on a threshold criterion of ≥5, 5 dominant configurations account for 31 cases (34% of total the sample). The most common dominant configurations of officer action points (Configs. #1, #2, and #3) have 7

cases each (see Figure 1).[7] There are 2 profiles with 5 cases. The overall escalation risk is 63.74% and two of the dominant officer action configurations surpass this overall risk substantially: Configs. #1 (85.7% risk of escalation) and #5 (80% risk of escalation). Configs. #1 and #5 are the only dominant configurations to include giving a shout command (with and without also giving a calm command) and account for 13.2% of use of force cases. Each of the lowest risk of escalation profiles (Configs. #2, #3, and #4) include no evidence of verbal antagonism by the officer, no shout command, and the delivery of a calm command. These action points are found in 20.8% of the sample. The lowest risk of force escalation is seen in Config. #2 (42.9% risk of escalation), which is also the profile containing the most procedurally just actions. These include announcing the presence of the BWC, providing a reason to the suspect for responding to the scene, explaining to the suspect why they were being detained, giving a calm command and no evidence of verbal antagonism, or shout command. This profile accounts for 7.7% of the total sample. Results of Hart's goodness-of-fit test are non-significant ($X^2(4) = .77; p = .94$), indicating the distribution of cases amongst dominant profiles is contextually independent—the inclusion of a greater number of cases per profile, is not meaningful.

[7] See APPENDIX B to view results as a truth table.

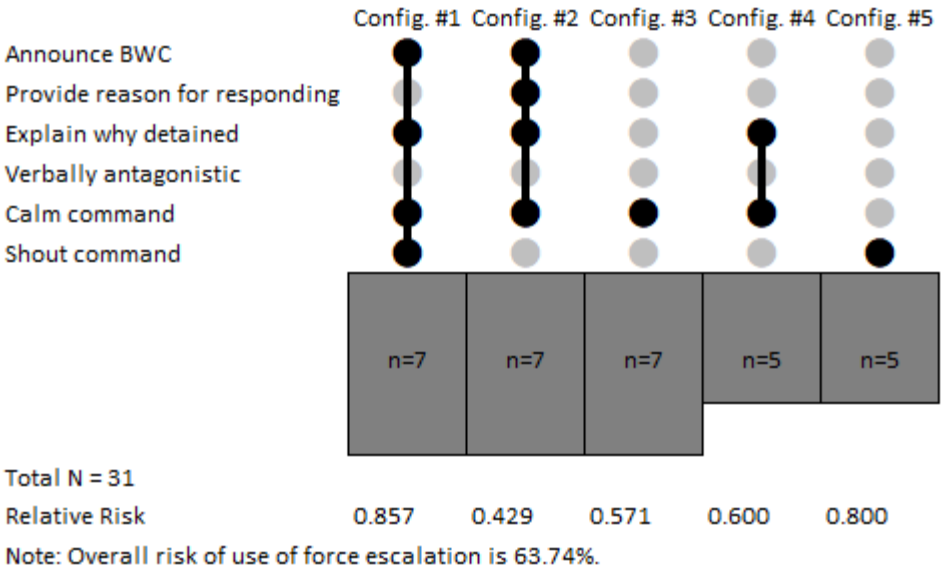


Figure 1. UpSet Plot: Officer Action Points. This figure presents dominant case configurations and relative risk of force escalation values for officer action points.

Suspect action points

Based on a threshold criterion of ≥5, 4 dominant configurations are identified and encompass 31 cases or 34% of sample. The most common profile (Config. #1) includes 11 cases (12.09%), there are 2 profiles with 7 cases each, and 1 with 6 cases (see Figure 2).

None of the dominant profiles include weapon possession or flee attempt and, at 45.5% risk, the most common suspect action point profile (Config. #1) is below the overall escalation risk of 63.74%. In this configuration there is no evidence of drug or alcohol impairment, the suspect attempted to express views, and was verbally and physically antagonistic to the officer. The profiles with the lowest risk of escalation (Configs. #1 and #3) are very similar to one another and together comprise 19.78% of total sample. The only difference between these is that in Config. #3, the suspects are not physically antagonistic indicating that physical assault of an officer does not predict escalation when elements such as weapon, flee and drug or alcohol impairment are also not present. In further support of this finding, Configs. #2 and #4 have a risk

of escalation higher than the overall risk of 63.74%, but they are quite different in composition. With a 100% risk of escalation, Config. #4 looks very similar to Config, #1. The only difference is evidence of suspect drug or alcohol impairment and the substantial disparity in risk of escalation.

Config. #2 is comprised of 7 cases, has a risk of escalation (85.7%) that is quite a bit higher than the overall risk and none of the suspect action points are present in these cases. There is no evidence of suspect impairment, the suspect was not physically antagonistic, the suspect did not possess a weapon, nor did they attempt flee. Results indicate that there is a sub-set of cases in which identified *performance-prevention linking constructs* are not necessary for escalation to take place, that more data is needed to identify additional suspect action points. Hart's goodness-of-fit test is non-significant ($X^2(3) = 1.90; p = .59$), again indicating the distribution of cases amongst dominant profiles does not vary by context.

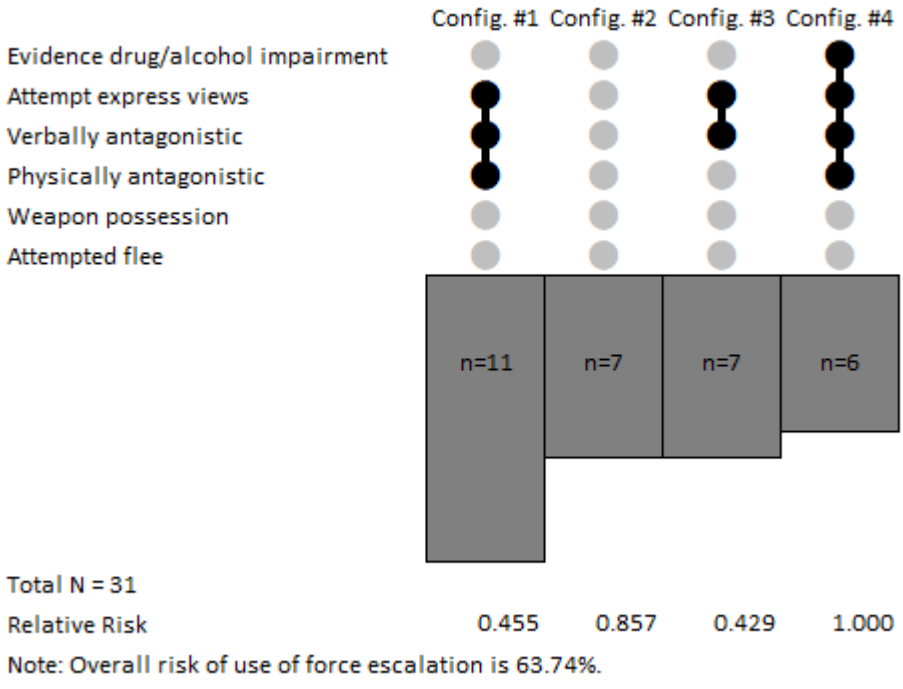


Figure 2. UpSet Plot: Suspect Action Points. This figure presents dominant case configurations and relative risk of force escalation values for suspect action points.

Environmental characteristics

Based on 6 characteristics, a total of 64 configurations are possible. There are 6 dominant profiles with 5 or more cases, accounting for 54 cases or 59.34% of the total sample. The most common configuration has 16 cases, there is 1 configuration with 10 cases, 1 with 8 cases, 2 with 7, and 1 with 6 cases (see Figure 3).

Three of the 6 dominant configurations have a risk of escalation greater than overall risk of 63.74% (Configs #1, #3, #5), accounting for 34.07% of total sample. Configs. #1 and #5 look very similar. Both include cases that took place outdoors, in public spaces, with no victim on scene, and no bystander of any type. Config. #1, with 68.8% risk of escalation differs from Config. #5, with 85.7% risk, only in that the latter consists of cases that took place during daytime and Config. #1 consists of cases that took place at night—suggesting daytime may elevate risk of escalation. Such an effect may be mitigated by the presence of a non-antagonistic bystander. Config #2 has a risk of escalation (20%) that is lower than the overall risk of 63.74% and much lower than that which is found in Config. #5. Config. #2 and Config. #5 are identical with the exception being the presence of a non-antagonistic bystander in Config. #2. Config. #4 further substantiates the theory that non-antagonistic bystanders can mitigate risk, as this profile looks quite similar to Config. #1, but at 57.1% risk of escalation, Config. #4 is lower than both Config. #1 and the overall risk of escalation. The central difference between Config. #4 and Config. #1 is the presence of both antagonistic and non-antagonistic bystanders. While the level of risk of escalation for Config. #4 is lower than that of Config #1, it is not as low as Config #2. However, it is unclear if the important point of departure between Configs. #2 and #4 is the time of day, or the presence of the antagonistic bystander found in Config. #4.

Config. #2 is similar to Config. #6, with the only difference being the presence of a victim on scene. While the risk of escalation for Config. #6 (50%) is still lower than the overall risk, it is higher than that which is seen in Config #2, suggesting the presence of a victim may inflame the situation. The other profile to include presence of victim on scene is Config. #3, which has a much higher risk of escalation (87.5%) compared to Config. #6 and a risk of escalation higher than the overall risk. Configs #3 and #6 both also include a non-antagonistic bystander and no antagonistic bystander, but the setting is quite different for Config. #3. Config. #3 consists of cases that take place during nighttime hours, indoors and in private spaces, suggested the protective effect of a non-antagonistic bystander disappears when the event moves indoors. Results of Hart's goodness-of-fit test are non-significant ($X^2(5) = 7.56; p = .18$), indicating that the number of cases per profile is not meaningful.

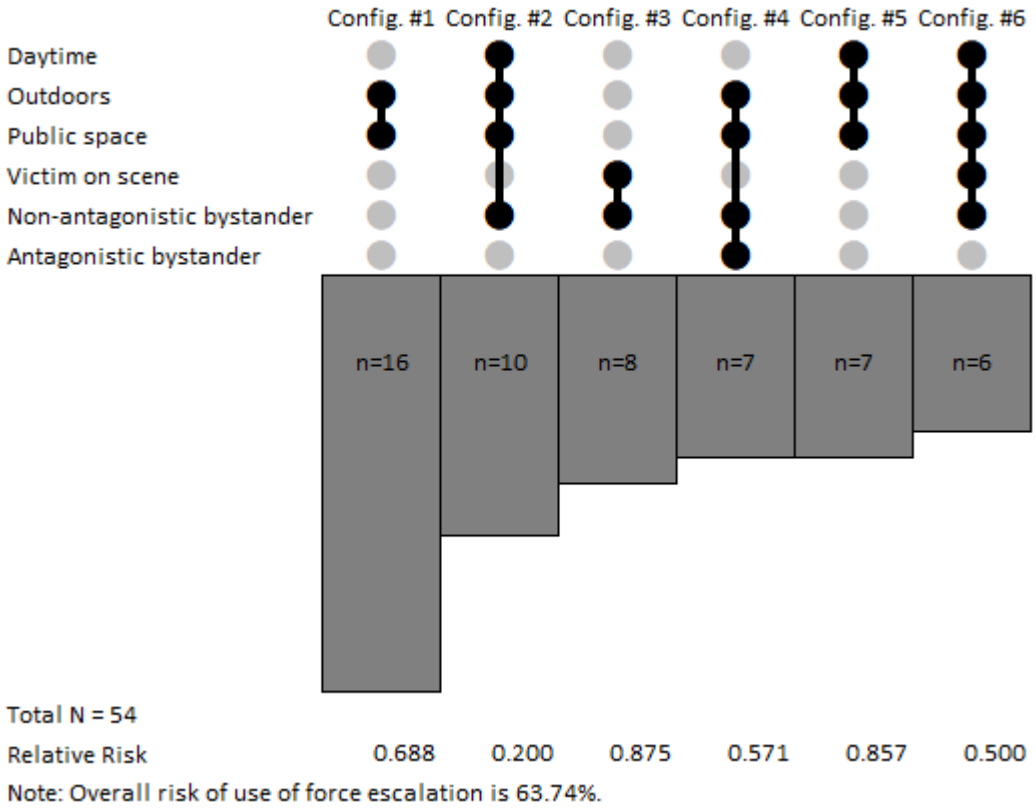


Figure 3. UpSet plot: Environmental Characteristics. This figure presents dominant case configurations and relative risk of force escalation values for environmental characteristics.

Demographic characteristics

Using a threshold criterion of ≥5, 5 dominant demographic characteristics profiles are produced, accounting for 60 cases or 65.93% of the sample. The most common profile (Config. #1) has 17 cases, there is 1 profile with 16 cases, 1 with 10, 1 with 9, and 1 profile with 8 cases (see Figure 4). All dominant configurations include Black or Hispanic suspects, male suspects, and male officers.

Configs. #1, #2, and #4 are each above the overall risk of escalation and account for 46.15% of the total sample. Configs. #1 and #2 are very similar. Both include cases with Black or Hispanic suspects and officers, male suspects and male officers, and suspects under the median suspect age. Config. #2 has a higher risk of escalation (75%) compared to Config. #1 (64.7%), and in Config. #2 the officer age is greater than the median officer age of 29-years. Config. #4 looks very similar to Config. #2, but includes cases with suspects greater than the median suspect age of 29. Config #4 has a risk of escalation (66.7%) which is higher than the overall risk, but lower than in Config. #2. These results suggest that officer age group is a more important predictor of risk of use of force escalation than is suspect age group; a theory that is furthered by Config. #3. Config #3 has a risk of 50% and is configured similarly to Config. #4, with the only difference being the officer age group, which is below the median office age of 29 years. In other words, the highest risk configurations have older officers, but differ in suspect age groups. Lower risk profiles have younger officers but differ in suspect age groups.

The exception to the above results surrounding officer age can be seen in Config. #5. All dominant profiles except Config. #5 include cases with Black or Hispanic officers. Like Configs. #2 and #4 (the highest risk profiles), Config. #5 also includes cases with officers greater than 29

years old. Despite this, the risk of escalation is below the overall risk. Config. #4 consists of all 9 cases in the sample that have suspects and officers who are Black or Hispanic, suspects and officers who are male, and suspects and officers greater than 29 years. Config. #5 consists of 8 cases that differ only in the ethnicity composition of the officers, who are white. While officer age group appears to be an important factor in risk of escalation, officer ethnicity appears to supersede age. Although older officers increase risk of escalation, when those officers are white, the risk decreases to below the overall risk of escalation. Results of Hart's goodness-of-fit test are non-significant ($X^2(4) = 5.83; p = .21$)

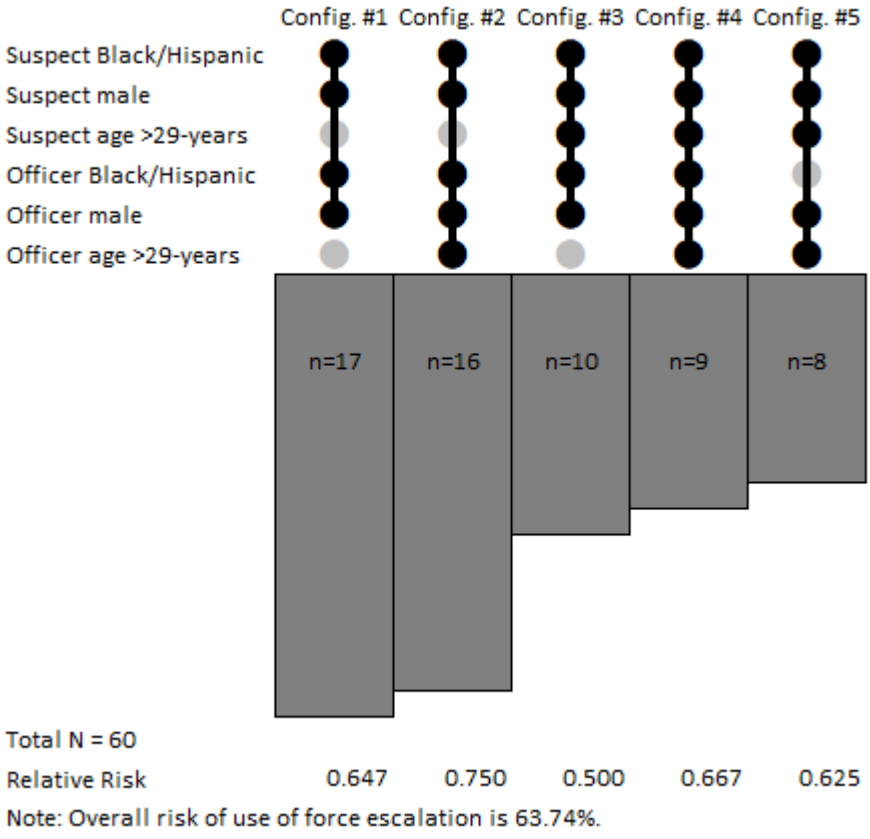


Figure 4. UpSet Plot: Demographic Characteristics. This figure presents dominant case configurations and relative risk of force escalation values for demographic characteristics.

Discussion

Based on Ekblom and Gill's (2016) combined functional and causal scripting approach, this exploratory study identifies action points and environmental characteristics present during use of force events which are indicative of *performance-prevention linking constructs*. We identified how cases are distributed among dominant case configurations of action point, and environmental and individual characteristic indicators, as well as determined the relative risk of use of force escalation from soft empty-hand force to more severe forms of force based on case configuration.

Results indicate that the overall escalation risk is 63.74%. Two of the dominant officer action configurations surpass this overall risk substantially and both include giving a shout command with and without also giving a calm command. The officer action profile with lowest risk of force escalation is also the profile containing the most actions indicative of a procedurally just interaction. These results point to the efficacy of officer use of persistent calm commands and behaving in a procedurally just manner for reducing risk of escalation, which is consistent with NPD's use of force policy (Newark Police Division, 2018, p. 14). While a recent multidisciplinary systematic review by Engel, McManus, and Herold (2020) indicated de-escalation training to be at least somewhat effective at changing attitudes and behaviors during interactions between trainees and the public, no studies in the field of policing were located for inclusion in the review. Further, the authors noted a lack of clear definition of the concept of 'de-escalation'. Pending replication of results of the present study, we advocate for the use of persistent verbal commands in preventing force escalation specifically in the field of policing, and it is our hope that these results provide some guidance around the inclusion of the use of verbal commands in conceptualizing 'de-escalation'. More generally, we repeat prior calls for

researchers to subject BWC footage to SSO analysis in order to create a rich evidence-based to inform police de-escalation strategies (Todak, 2019).

Suspect physical antagonism does not predict escalation when elements such as weapon, suspect flee, and suspect drug or alcohol impairment are also absent. Evidence of drug or alcohol impairment of the suspect appears to be one of the most important contributors to risk of escalation. Research by Lawton (2007, p. 178) found that "officers increase the force applied in situations where they are likely to have a more difficult time gaining control of the situation or in situations that are less predictable." Given the empirical connection between use of force and impairment due to substance and/or extreme psychological excitement (Baldwin et al., 2018), upon replicating study findings, crisis intervention training for officers is advised. Using a sample of 1,063 police-citizen encounters with either suspected mentally ill or substance using individuals, research by Compton et al. (2014) found that at the situational level, officers with crisis intervention training were more likely to rely on verbalization over physical force compared to those without training.

While daytime may elevate risk of escalation, such an effect may be mitigated by the presence of a non-antagonistic bystander. These results suggest that certain types of bystanders can have a civilizing effect on suspects. Some research suggests that BWCs can have a similar civilizing effect on civilians (ODS Consulting, 2011) and can reduce instances of violent police victimization (Douglas, 2020), although other research points to the opposite (Ariel et al., 2016). Owens and Finn (2018) suggest that when BWC-equipped officers narrate police-citizen interactions as they unfold, officers may be more likely to adhere to principles of procedural justice. That said it is also possible that narrating incidents has a civilizing effect on suspects. To create a heightened awareness of the presence of a recording device for the purpose of civilizing

suspects, wearers of BWCs may consider narrating interactions as they unfold, but more research is needed linking narrations to suspect actions. Further, cases that take place during nighttime hours, indoors and in private spaces, when the victim is present, suggest the presence of a victim may inflame the situation. Pending replication of study results, we advocate for immediate physical separation of victim and suspect when in a private space.

Results suggest that officer age group is a more important predictor of risk of use of force escalation than is suspect age group. The highest risk configurations include older officers and the lowest risk profiles include younger officers. Police officers who subscribe to a police culture congruent with more unjust practices are more likely to use force (Terrill, Paoline, & Manning, 2003), and procedural justice training is associated with a reduction in use of force (Wood et al., 2020). Older or more experienced officers may be resistant or not exposed to cultural shifts in policing, as well as procedural justice and crisis intervention training. As such, following replication of study results, regular procedural justice training is advised for all officers.

Finally, while officer age group appears to be an important factor in risk of escalation, officer ethnicity appears to supersede age. Although older officers increase risk of escalation, when those officers are white, the risk decreases to below the overall risk of escalation. Findings are consistent with those of Sharp and Atherton (2007), who found that young people in the United Kingdom characterized interactions with Black and minority officers as sometimes more aggressive than their white counterparts. While laboratory experiments have shown implicit-bias training with a 'habit-breaking' approach to be effective at reducing implicit racial bias over the long-term (Devine, Forscher, Austin, & Cox, 2012; Forscher et al., 2017) and we advocate for piloting this type of training in the city of Newark, it should be noted that each locale is unique. For instance, our findings contrast with those of Lawton (2007), who found neither officer nor

civilian race played a significant role in level of force used in Philadelphia; and Brunson and Miller (2006), who found little difference by officer race in the treatment of their St. Louis research subjects. Further research is needed to explore how officer perceptions around use of force differ by officer ethnicity, and how those perceptions differ depending on the ecology of the jurisdictions they serve.

This work presents a pilot of the use of CACC for script analysis and the results of this study point to worthwhile policy implications. However, this study does include several limitations. First, this study is exploratory in nature and relies on a very small sample size. To provide sample size guidance for achieving 80% statistical power, we present a prospective power analyses in Table 3, where $\alpha = .05$, effect size $w = .3$.[8] Degrees of freedom were calculated using Hart's (2020) approach of subtracting 1 from the number of dominant configurations. Thus, in a truth table containing 5 dominant configurations, summing the number of cases found in each of the 5 configurations should result in a sample size of ≥133. While we presently offer a relative risk value of the outcome given a particular profile, by increasing statistical power, clustering is more likely to be context-dependent; thus, the number of cases by configuration will depend on the items included in the profile.[9]

Table 3. Prospective Power Analysis

Case Configuration	df	Sample Size	X^2 Critical Value	Power
Officer action points	4	133	9.49	.80
Suspect action points	3	122	7.81	.80
Environmental characteristics	5	143	11.07	.80
Demographic characteristics	4	133	9.49	.80

Note: Results based on $\alpha = .05$; effect size $w = .3$

[8] Power analyses were conducted using G*Power Statistical Power Analysis for Windows and Mac version 3.1.9. For more information on determining effect size thresholds in power analysis, see Cohen (1988).

[9] Applying traditional power analyses to case configurations should be approached with caution as most power analyses rely on a given population, rather than a constructed population to estimate expected frequencies (see Ragin, 2013; Rohlfing, 2018).

Our analytical approach of producing separate truth tables for each actor and environmental variable grouping prevented exploration of interaction effects between officer and suspect action points. Additionally, this study could be strengthened with the inclusion of a comparison group of cases in which force did not occur to determine how dominant configurations differ across outcomes. Future research should engage statistical matching to create equivalent groups and develop action and environmental profiles for both the use of force and comparison groups. Finally, because the data source for this study is primarily camera footage, we were unable to account for pre-event characteristics such as officer use of force histories or suspect criminal histories. Despite limitations, we offer a novel approach to script analysis, as well as provide prevention strategies related to escalation of police use of force—an event which is of grave concern to practitioners, researchers, and the public.

References

Abelson, R. (1976). Script processing in attitude formation and decision making. Pp. 33-46 in John Carroll and John Payne. (Eds.), *Cognition and social behavior*. New York, NY: Erlbaum.

Abelson, R. (1981). Psychological status of the script concept. *American Psychologist, 36*, 715-729.

Alpert, G.P., Dunham, R.G., & MacDonald, J.M. (2004). Interactive police-citizen encounters that result in force. *Police Quarterly, 7*(4), 475-488.

Alpert, G. P., & Dunham, R. G. (1997). The force factor: Measuring police use of force relative to suspect resistance. Washington, DC: Police Executive Research Forum.

Alpert, G. P., & Smith, W. C. (1994). How reasonable is the reasonable man: Police and excessive force. *Journal of Criminal Law & Criminology*, *85*(2), 481-501.

Ariel, B. et al. (2016). Wearing body cameras increases assaults against officers and does not reduce police use of force: Results from a global multi-site experiment. *European Journal of Criminology, 13*(6), 744–755.

Baldwin, S., Hall, C., Blaskovits, B., Bennell, C., Lawrence, C., & Semple, T. (2018). Excited delirium syndrome (ExDS): Situational factors and risks to officer safety in non-fatal use of force encounters. *International Journal of Law and Psychiatry, 60*, 26-34.

Binder, A., & Scharf, P. (1980). The violent police-citizen encounter. *The ANNALS of the American Academy of Political and Social Science, 452*(1), 111-121.

Bolger, P. C. (2015). Just following orders: A meta-analysis of the correlates of American police officer use of force decisions. *American Journal of Criminal Justice*, *40*(3), 466-492.

Brantingham, P.J. & Brantingham, P.L. (1984). *Patterns in crime.* New York. NY: Macmillan.

Brantingham, P.L. & Brantingham, P.J. (1993). Nodes, paths and edges: Considerations on the complexity of crime and the physical environment. *Journal of Environmental Psychology, 13*, 3-28.

Brayley, H., Cockbain, E., & Laycock, G. (2011). The value of crime scripting: Deconstructing internal child sex trafficking. *Policing, 5*(2), 132-143.

Brunson, R. (2007). "Police don't like black people": African-American young men's accumulated police experiences. *Criminology & Public Policy, 6*(1), 71-101.

Brunson, R.K. & Miller, J. (2006). Young black men and urban policing in the United States. *British Journal of Criminology, 46*(4), 613-40.

Bryant, W., Townsley, M., & Leclerc, B. (2014). Preventing maritime pirate attacks: A conjunctive analysis of the effectiveness of ship protection measures recommended by the international maritime organization. *Journal of Transportation Security, 7*, 69-82.

Chiu, Y., Leclerc, B., & Townsley, M. (2011). Crime script analysis of drug manufacturing in clandestine laboratories: Implications for prevention. *British Journal of Criminology, 51*, 355-374.

Clarke, R.V. (1983). Situational crime prevention: Its theoretical basis and practical scope. In M. Tonry & N. Morris (Eds.), *Crime and Justice* (Vol. 4) (225-256). Chicago: University of Chicago Press.

Clarke, R.V. & Cornish, D.B. (1985). Modeling offenders' decisions: A framework for research and policy. In M. Tonry & N. Morris (Eds.), *Crime and Justice* (Vol. 6) (147-185). Chicago: University of Chicago Press.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Compton, M. T. et al. (2014). The police-based crisis intervention team (CIT) model: II. Effects on level of force and resolution, referral and arrest. *Psychiatric Services, 65*(4), 523-529.

Cornish, D. (1994a). Crimes as scripts. pp. 30-45 in Diane Zahm & Paul Cromwell (eds.), *Proceedings of the International Seminar on Environmental Criminology and Crime Analysis*. Coral Gables, FL: Florida Criminal Justice Executive Institute.

Cornish, D. (1994b). The procedural analysis of offending and its relevance for situational prevention. In R.V. Clarke (ed.), *Crime Prevention Studies*, vol. 3 (151-196). Monsey, NY: Criminal Justice Press.

Cornish, D.B. & Clarke, R.V. (1987). Understanding crime displacement: An application of rational choice theory. *Criminology, 25*(4), 933-947.

Davis, E., Whyde, A., & Langton, L. (2018). Contacts between police and the public, 2015. Washington, DC: Department of Justice, U.S. Bureau of Justice Statistics. Retrieved from https://www.bjs.gov/content/pub/pdf/cpp15.pdf

Dehghanniri, H. & Borrion, H. (2019 online). Crime scripting: A systematic review. *European Journal of Criminology*, 1-22.

DeLeeuw, J. G., & Pridemore, W. A. (2018). The threat from within: A conjunctive analysis of domestic terrorism incidents in the United States, United Kingdom, and Ireland. *Perspectives on Terrorism*, *12*, 26-54.

Devine, P.G., Forscher, P.S., Austin, A.J., Cox, W.T. (2012). Long-term reduction in implicit

race bias: A prejudice habit-breaking intervention. *Journal of Experimental Social Psychology*, *48* (6), 1267–1278.

Douglas, S. (2020). The effects of body-worn cameras on violent police victimization. *Policing: A Journal of Policy and Practice,* DOI: 10.1093/police/paaa032.

Doherty, E. E., & Cwick, J. M. (2016). Unpacking the complexity of life events and desistance: An application of Conjunctive Analysis of Case Configurations to developmental and life course criminology. *Journal of Developmental and Life Course Criminology*, *2*, 45-63.

Dror, I. E. (2007). Perception of risk and the decision to use force. *Policing: A Journal of Policy and Practice*, *1*(3), 265-272.

Ekblom, P., & Gill, M. (2016). Rewriting the script: Cross-disciplinary exploration and conceptual consolidation of the procedural analysis of crime. *European Journal on Criminal Policy and Research, 22*, 319-339.

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

Forscher, P.S., Mitamura, C., Dix, E.L., Cox, W.T., Devine, P.G. (2017). Breaking the prejudice habit: Mechanisms, timecourse, and longevity. *Journal of Experimental Social Psychology, 72,* 133–146.

Garner, J.H., Maxwell, C.D., Heraux, C.G. (2002). Characteristics associated with the prevalence and severity of force used by the police. *Justice Quarterly, 194*, 705–746

Glaser, B. G. (2016). Open coding descriptions. *Grounded Theory Review*, *15*(2), 108-110.

Gruenewald, J., Klein, B. R., Drawve, G., Smith, B. L., & Ratcliff, K. (2019). Suspicious preoperational activities and law enforcement interdiction of terrorist plots. *Policing, 42*, 89-107.

Hart, T.C. (2020). Identifying situational clustering and quantifying its magnitude in dominant case configurations: New methods for conjunctive analysis. *Crime & Delinquency*, *66*(1), 143-159.

Hart, T.C. & Miethe, T.D. (2015). Configural behavior settings of crime event locations: Toward an alternative conceptualization of criminogenic microenvironments. *Journal of Research in Crime and Delinquency*, *52*(3), 373-402.

Holt, T.J. & Lee, J.R. (2020). A crime script analysis of counterfeit identity document procurement online. *Deviant Behavior*, DOI: 10.1080/01639625.2020.1825915

Hutchings, A, & Holt, T.J. (2015). A crime script analysis of the online stolen data market. *British*

Journal of Criminology, 55, 596-614.

Keatley, D.A., Mcgurk, S., & Allely, C.S. (2020) Understanding School Shootings with Crime Script Analysis, *Deviant Behavior, 41*(9), 1084-1096.

Kirk, D.S. & Matsuda, M. (2011). Legal cynicism, collective efficacy, and the ecology of arrest. *Criminology, 49*(2), 433-472.

Kirk, D.S. & Papachristos, A.V. (2011). Cultural mechanisms and the persistence of neighborhood violence. *American Journal of Sociology, 116*, 1190–233.

Lawton, B. A. (2007). Levels of Nonlethal Force: An Examination of Individual, Situational, and Contextual Factors. *Journal of Research in Crime and Delinquency*, *44*(2), 163–184.

Leclerc, B. & Reynald, D. (2017). When scripts and guardianship unite: A script model to facilitate intervention of capable guardians in public settings. *Security Journal, 30,* 793-806.

Leclerc, B. & Wortley, R. (2014). The reasoning criminal: Twenty-five years on. Pp. 1-11 in *Cognition and Crime: Offender Decision Making and Script Analysis*, edited by Benoit Leclerc and Richard Wortley. New York: Routledge.

Leclerc, B, Wortley, R., & Smallbone, S. (2011). Getting into the script of adult child sex offenders and mapping out situational prevention measures. *Journal of Research in Crime and Delinquency, 48*(2), 209-237.

MacDonald, J. M., Manz, P. W., Alpert, G. P., & Dunham, R. G. (2003). Police use of force: Examining the relationship between calls for service and the balance of police force and suspect resistance. *Journal of Criminal Justice*, *31*(2), 119-127.

Malm, A. (2019). Promise of police body-worn cameras. *Criminology & Public Policy*, *18*(1), 119–130.

Makin, D. A., Willits, D. W., & Brooks, R. (2020). Systematic social event modeling : a methodology for analyzing body-worn camera footage body-worn camera footage. *International Journal of Social Research Methodology*, DOI: 10.1080/13645579.2020.1766775

Miethe, T.D., Hart, T.C., & Regoeczi, W.C. (2008). The conjunctive analysis of case configurations: An exploratory method for discrete multivariate analyses of crime data. *Journal of Quantitative Criminology, 24*(2), 227-241.

Miethe, T.D. & Sousa, W.H. (2010). Carjacking and its consequences: A situational analysis of risk factors for differential outcomes. *Security Journal, 23*, 241-258.

Nassauer, A., & Legewie, N.M. (2018). Video data analysis: A methodological frame for a novel

research trend. *Sociological Methods & Research*, 1-40.

National Institute of Justice (NIJ). (2009). *The use-of-force continuum.* Retrieved from http://www.nij.gov/topics/law-enforcement/officer-safety/use-of-force/pages/continuum.aspx

Newark Police Division. (2018). *Newark Police Division general order no. 18-20: Use of force*. Newark, NJ: Newark Police Division. Retrieved from https://c3bb32f4-4b49-462c-abf8-5d2c1d510fe0.filesusr.com/ugd/582c35_25e1670cb2c040069c4139f2ccae9974.pdf

ODS Consulting (2011). Body worn video projects in Paisley and Aberdeen: Self-evaluation. Glasgow, Scotland: Author. Retrieved from http://www.bwvsg.com/wp-content/uploads/2013/07/BWV-Scottish-Report.pdf

Owens, C., & Finn, W. (2018). Body-worn video through the lens of a cluster randomized controlled trial in London: Implications for future research. *Policing: A Journal of Policy and Practice, 12*(1), 77–82.

Paoline III, E. A., & Terrill, W. (2007). Police education, experience, and the use of force. *Criminal Justice and Behavior*, *34*(2), 179-196.

Regin, C. (2013). New directions in the logic of social inquiry. *Political Research Quarterly, 66*(1), 171-174.

Reiss, A.J. (1968). Police brutality-answers to key questions. *Trans-action*, *5*, 10-19.

Reiss, A.J. (1971). Systematic observation of natural social phenomena. *Sociological Methodology*, *3*, 3-33.

Rennison, C.M., Dragiewicz, M., & DeKeseredy, W.S. (2013). Context matters: Violence against women and reporting to police in rural, suburban and urban areas. *American Journal of Criminal Justice, 38*, 141-159.

Rohlfing, I. (2018). Power and false negatives in qualitative comparative analysis: Foundations, simulation and estimation for empirical studies. *Political Analysis, 26*, 72-89.

Rosenbaum, D.P., Schuck, A.M., Costello, S.K., Hawkins, D.F., & Ring, M.K. (2005). Attitudes toward the police: The effects of direct and vicarious experience. *Police Quarterly, 8*, 343–365.

Rossler, M. T., & Terrill, W. (2017). Mental illness, police use of force, and citizen injury. *Police Quarterly*, *20*(2), 189-212.

Sampson, R. J., & Bartusch, D. J. (1998). Legal cynicism and (subcultural?) tolerance of deviance: The neighborhood context of racial differences. *Law & Society Review*, *32*(4), 777-804.

Schank, R. & Abelson, R. (1977). *Scripts, plans, goals and understanding: An inquiry into human knowledge*. Hillsdale, NJ: Erlbaum.

Shaffer, D.K.& Miethe, T.D. (2011). Are similar sex offenders treated similarly? A conjunctive analysis of disparities in community notification decisions. *Journal of Research in Crime and Delinquency, 48*(3), 448-471.

Sharp, D. & Atherton, S. (2007). To serve and protect? The experiences of policing in the community of young people from black and other ethnic minority groups. *British Journal of Criminology, 47*(5), 746-763.

Sherman, L. W. (1980). Causes of police behavior: The current state of quantitative research. *Journal of Research in Crime and Delinquency, 17*(1), 69-100.

Sytsma, V. & Piza, E. (2018). Script analysis of open-air drug selling: A systematic social observation of CCTV footage. *Journal of Research in Crime and Delinquency, 55*(1), 78-102.

Terrill, W. (2003). Police use of force and suspect resistance: The micro-process of the police suspect encounter. *Police Quarterly, 6*, 51-83.

Terrill, W. (2005). Police use of force: A transactional approach. *Justice Quarterly, 22*, 107-138.

Terrill, W., Paoline, E.A., & Manning, P.K. (2003). Police culture and coercion. *Criminology, 41*(4), 1003-1034.

Toch, H. (1969). Violent men: An inquiry into the psychology of violence. Chicago: Aldine.

Todak, N. (2019). Using body-worn cameras to create an evidence based de-escalation training program. *Evidence based policing: An introduction*. (pp. 187–196). Bristol, UK.: Policy Press.

Todak, N. & James, L. (2018). A systematic social observation study of police de-escalation tactics. *Police Quarterly, 21*(4), 509-543.

U.S. Department of Justice Civil Rights Division. (2014). Investigation of the Newark Police Department. United States Attorney's Office, District of New Jersey.

White, M. D. (2016). Transactional encounters, crisis-driven reform, and the potential for a national police deadly force database. *Criminology & Pub. Pol'y*, *15*, 223.

Willits, D. W., & Makin, D. A. (2018). Show me what happened: Analyzing use of force through analysis of body-worn camera footage. *Journal of Research in Crime and Delinquency, 55*(1), 51-77.

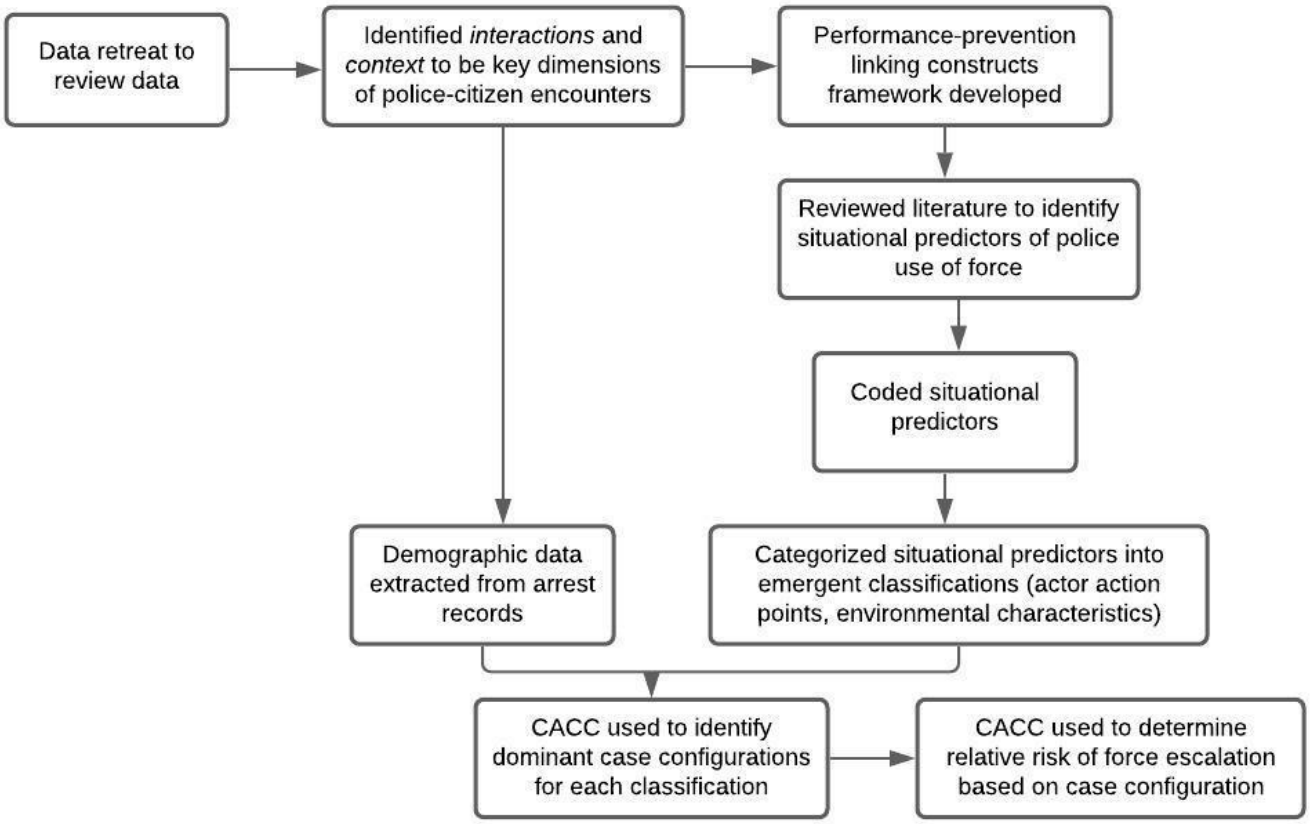
Wood, G., Tyler, T.R., & Papachristos, A.V. (2020). Procedural justice training reduces police use of force and complaints against officers. *Proceedings of the National Academy of Sciences, 117*(18), 9815-9821.

Wortley, R. (2008). Situational precipitators of crime. In R. Wortley & L. Mazerolle (Eds.), Environmental Criminology and Crime Analysis. Cullompton: Willan.

Court Cases Cited

United States v. City of Newark (2016). consent decree, No.2:16-cv-01731-MCA-MAH.

APPENDIX A.



Measurement, Coding, and Analytical Procedures Workflow. This figure depicts the workflow associated with measurement, coding, and analytical procedures.

APPENDIX B. Truth Table of Dominant Case Configurations by Relative Risk of Escalation of Police Officer use of Force

Officer Action Points

Config. #	Announce BWC	Provide reason for responding	Explain why detained	Verbally antagonistic	Calm command	Shout command	Relative risk	N
1	1	0	1	0	1	1	0.857	7
2	1	1	1	0	1	0	0.429	7
3	0	0	0	0	1	0	0.571	7
4	0	0	1	0	1	0	0.600	5
5	0	0	0	0	0	1	0.800	5
								Total: 31

$X^2(4) = .77; p = .94$

Suspect Action Points

Config. #	Evidence drug/alcohol impairment	Attempt express views	Verbally antagonistic	Physically antagonistic	Weapon possession	Attempted flee	Relative risk	N
1	0	1	1	1	0	0	0.455	11
2	0	0	0	0	0	0	0.857	7
3	0	1	1	0	0	0	0.429	7
4	1	1	1	1	0	0	1.000	6
								Total: 31

$X^2(3) = 1.90; p = .59$

Environmental Characteristics

Config. #	Daytime	Outdoors	Public space	Victim on scene	Non-antagonistic bystander	Antagonistic bystander	Relative risk	N
1	0	1	1	0	0	0	0.688	16
2	1	1	1	0	1	0	0.200	10
3	0	0	0	1	1	0	0.875	8
4	0	1	1	0	1	1	0.571	7
5	1	1	1	0	0	0	0.857	7
6	1	1	1	1	1	0	0.500	6
								Total: 54

$X^2(5) = 7.56; p = .18$

Demographic Characteristics

Config. #	Suspect Black/Hispanic	Suspect male	Suspect age >29-years	Officer Black/Hispanic	Officer male	Officer age >29-years	Relative risk	N
1	1	1	0	1	1	0	0.647	17
2	1	1	0	1	1	1	0.750	16
3	1	1	1	1	1	0	0.500	10
4	1	1	1	1	1	1	0.667	9
5	1	1	1	0	1	1	0.625	8
								Total: 60

$X^2(4) = 5.83; p = .21$

Note: Overall risk of use of force escalation is 63.74%.