Police Use of Force Models

Recent calls for widespread police reform include re-examination of existing training and practice surrounding the use of force (UOF, e.g., verbal and non-verbal communication, physical tactics, firearms). Visual models representing police UOF decision-making are used for both police training and public communication. However, most models have not been empirically developed or assessed in either the applied police or vision science literatures, representing significant gaps in knowledge. Based on a critical appraisal of the visual features of common police UOF models, the current entry concludes with evidence-based recommendations for effective model design that accurately reflects the complexity and dynamism of police UOF decision-making in both police training and public communication contexts.

Keywords: visual models ; information visualization ; critical decision-making ; police training ; use of force ; de-escalation

1. Overview and Context

Public outcry over police encounters that result in a use of force (UOF), especially lethal force, against unarmed citizens or individuals suffering a mental health crisis has recently reached a boiling point. As with many concepts and practices in policing, UOF is inconsistently defined and operationalized [1]. As defined here, UOF encompasses discrete verbal and non-verbal communication (including de-escalation), and physical skills and tactics (i.e., arrest, holding, and hand-to-hand defensive maneuvers) to bring the situation under control. Depending on individual agency resources and policies, UOF also encompasses available force options such as oleoresin capsicum (OC) spray (i.e., pepper spray), baton, canine response, non-lethal weapons including conduced energy weapons (i.e., Taser) or beanbag guns, and duty weapon or firearm [2]. Finally, UOF can also be defined as the cognitive processes related to perceiving (i.e., attending to), understanding, and evaluating the current situation (i.e., situational awareness, threat assessment) and decision-making to select the appropriate UOF option [3].

Beginning in the 1970's, North American police agencies have increasingly utilized visual models in training contexts to represent the various elements of UOF defined above, and also to communicate police UOF policies to the public. However, a number of current police UOF models do not meet these intended goals. Below is a brief summary of a larger work that critically appraises the visual features of common police UOF models, and concludes with recommendations for effective model design based on this analysis [4].

2. Circular Models: Ontario Use of Force Model

Circular models are exemplified by the Ontario UOF Model (see Figure 1 in [4]). The national framework from which the current Ontario UOF Model was developed states that the model is intended to (a) assist in police UOF training and (b) serve "as a reference when making decisions and explaining their actions" [5] (p. 4). Recent reviews connecting police performance to stress physiology research suggest that it is very unlikely that highly complex models, like the Ontario UOF Model, would be consulted or recalled *during* a potential UOF encounter, unless deeply encoded into long-term implicit memory [6] As a graphical form, the authors of the Ontario UOF Model rely on an implicit clock metaphor, implicit insofar as there are no overt cues to orient the viewer to that visual analogy. It is designed such that the viewer's attention is first drawn to the twelve o'clock position and then proceeds to follow a clockwise sequence. Ideally, colour contrast (Section 5) and prominent shapes would attract the eye to that starting position, then progress through the force options and situational factors. In this case, however, visually dominant red and black backgrounds draw to the end of the sequence, likely causing momentary disorientation. Circular graphical formats have also been adopted with the intention of reflecting the non-linear nature of UOF encounters [6], such that forward progression (i.e., escalation) can also be dynamically reversed (i.e., de-escalation). The potential for this form to communicate non-linearity is undermined by other features, including the use of colour, and three-dimensional design elements, which are discussed in more detail in the full version of this article.

2. Cycle Models: The BC-CID Model

Cycle models show a recurring sequence of steps, stages, or phases. They are ideal for showing discrete activities that happen over time in a fixed order. The Ontario UOF Model contains a unidirectional cycle at its centre (i.e., arrows go one way). The British Columbia Crisis Intervention and De-escalation (BC-CID) Model (see Figure 3 in [4]) was reviewed by Ombudsman Dubé [7] as an alternative police UOF decision-making model. The BC-CID Model shows a bidirectional cycle (i.e., arrows go both ways), implying that the officer may return to earlier phases in accordance with "the natural ebb and flow of communication in a crisis situation" (p. 31). However, the use of numerous unlabeled arrows can create "crap circles," or cycles that overuse multiple different shapes, directional arrows, angles, and curvatures to clarify an idea but end up obscuring it [8]. The BC-CID Model appears clear at first because of its simplicity. The model is simple only insofar as little information is presented and creates a false sense of understandability. As stated by Cairo [9]: "Simplicity isn't just about reduction. It can (and should) also be about augmentation" (p. 97). What does the BC-CID Model really tell us about police UOF decision-making or intervention in crisis situations? How is this model specific to police? The genericism of the labels suggests that this sequence could apply to any sort of analytic process; there are no subject- or occupation-specific distinctions. Therefore, cycle models such as the BC-CID Model tend to oversimplify the activities that take place at each stage of police UOF decision-making and crisis intervention.

Although the BC-CID Model is part of a larger training curriculum that encompasses both UOF decision-making and crisis intervention, the visual model itself brings no additional understanding to the way in which an officer actually responds to a person in crisis. Several typographical (Section 7.1) and linguistic features (Section 7.2) of the BC-CID Model are also problematic (see [4]). The title is stated on the left side of the model and repeated in the middle. Together with the repetition of "risk assessment" around the outer circle, such redundancy means a lost opportunity to provide additional meaningful information. Further, the re-orientation of reading vertically versus horizontally presented text requires uncomfortable eye movements and may elicit a sense of frustration in the reader [10]. Using technocratic broad language (e.g., "build solutions") does not help the public understand or provide officers with options or language to articulate what actions they might take to effectively address a crisis. Further, these terms may be interpreted very differently by police services, officers within the same service, and the public. Using broad language is an abstraction of a solution without committing to any substantive instruction. As with other simplistic models, extensive secondary source documents are required to interpret them (see Section 9.3 in [4]), defeating the purpose of a stand-alone visual model.

3. Linear or Staircase Models - The Las Vegas Model

In contrast to the circular model types reviewed above, police UOF decision-making is often represented in the form of linear continuum models, or staircase models (see Figure 4 in [4]). Staircase models are intended to provide a reflective approach to selecting the least intrusive force option from a list or "menu" [11]. Also represented on the Ontario UOF Model, force options typically begin with officer presence or verbal commands. Force options progress in increasing intrusiveness or potential for bodily or deadly harm, ending with lethal force. Accompanying language suggest deliberation or critical assessment of which force option is most appropriate (i.e., "escalation", "de-escalation"), with the goal of every potentially violent encounter being successful de-escalation. Both language and other visual features including directional arrows suggest that officers can consider progressing both up or down the UOF continuum. While progressing through every force option may not be appropriate in all situations, a visual continuum implies a sequential approach [11]. Similar to the analog clock metaphor of circular models, the staircase metaphor combined with colours leads the eye (see Section 6 in [4]), especially for readers of left-to-right languages, and connotes moving from one state to another. The resulting interpretation is that escalation is an inevitable outcome. The designers of the Las Vegas model have attempted to counter this inevitability by adding multiple visual elements that only confuse interpretation of the information present. Specifically, there is a juxtaposition in that moving up the top directional arrow (or escalation) is dictated by subject behavior, and moving down (or de-escalation) on the bottom arrow is the goal of officer behavior, which is not what stairs visually imply (left-to-right movement towards escalation). Labeling the same axis twice (i.e., suspect's action/level of resistance, level of control/officer's response) is redundant, confusing, and not scientifically supported [12] (p. 61).

Staircase models often make heavy and problematic use of text to express the numerous UOF options available to officers in a broad range of encounters that vary from no threat to life threat. The use of numerous visual features including text, colour, and directional arrows reduce their interpretability and clarity. The Las Vegas Model specifically features a significant number of bullet points and acronyms, which are not fully articulated thoughts and violate the *principle of portability:* all information necessary for interpretation of a graphic should be contained within the graphic itself, unless there is a reasonable expectation that the audience will already know a particular item. When incomplete thoughts

and acronyms are used, observers are required to scan through the entire chart to find explanations, or search through a separate source document (see Section 9 in[4]). Both of these options require significant effort and are unlikely to be undertaken unless this information is explicitly provided as during formal training. Source documentation has been separated from the police UOF models included in the current review, and therefore they cannot stand alone.

4. Recommendations for Evidence-Based Design of Visual Models for Police UOF Decision-Making

Based on the critical appraisal in [4], the following evidence-based recommendations rooted in vision science and information visualization can aid in the development of effective police UOF models that fulfill the goals defined by police stakeholders [13].

- Police UOF decision-making is a complex process which requires graphical models that display this complexity without being cluttered, overwhelming or confusing. Content should be explanatory and purposeful [14][15][16]. Therefore, redundancy and repetition should be avoided to save visual space for informative and meaningful content;
- Models should represent UOF decision-making as a continuous and dynamic process that emphasizes backward motion (i.e., de-escalation);
  - Caveat 1: donut charts that feature segments are not recommended because they require the observer to perform mental calculations and interpretations of the relative area occupied by each segment within the circle to gain some meaning from the information presented;
  - Caveat 2: segmenting force options from least to most intrusive (i.e., clockwise or left-to-right, smallest to largest) suggests that the last segment (lethal force) is the most frequent and important [17] – therefore equally sized and represented force options are recommended to avoid misrepresentation and/or misinterpretation of the relative frequency of police lethal force responses;
- To reduce cognitive load, fatigue, and conflation of information, designers should use a single chart type and minimize the use of multiple different shapes, directional arrows, angles, and curvatures;
- Avoid use of 3D effects to maintain visual precision of chart elements;
- If colour is used, designers should utilize colour palettes that are accessible to individuals with colour blindness, see [18];
- Highly saturated colours should be limited to small areas to draw visual focus, while low saturation colours should be used in larger areas to promote readability [19];
- Use of greyscale, especially underneath imposed text, is not recommended because greyscales are prone to degradation under certain circumstances (i.e., photocopying, printing, different screen resolutions)
- Black-and-white (BW) graphics are recommended for several reasons:
  - Can be reproduced on a wider range of office equipment and at reduced cost relative to colour graphics
  - BW images and text have the highest contrast, and therefore the best visibility and greatest portability, especially for viewers with visual impairment, including but not limited to colour blindness [20]
  - Avoid controversy related to the potential social or cultural connotations associated with particular colours
- Visual features should be prepared with professional typefaces in vector graphical formatting. Additional shapes, boxes, and arrows should also be prepared to appear professional and clean to minimize appearing 'amateurish';
- For public communication purposes, each type of force encounter should be represented proportionately to its occurrence based on available UOF data, or a statement referring to the proportion of each type of encounter should be featured on the public version of the model
- Any new visual models representing police UOF, either for police training or public communication purposes, should be empirically evaluated for its effectiveness in conveying information through scientific inquiry (e.g., focus groups, evaluation of learning outcomes compared to training with other visual UOF models)

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