Routledge
Taylor & Francis Group

Imagining grim stories to reduce redundant deliberation in critical incident decision-making

Laurence Alison[a], Neil Shortland[b], Marek Palasinski[c] and Michael Humann[d]

[a]Institute of Psychology, Health and Society, University of Liverpool, UK; [b]School of Criminology and Justice Studies, University of Massachusetts Lowell, USA; [c]School of Psychology, Liverpool John Moores University, UK; [d]Centre for Educational Development & Support, University of Liverpool, UK

IMPACT
Leaders spend years developing their abilities and acquiring expertise in their specialist fields, in order to become competent and skilled decision-makers. These capabilities are tested during critical incidents—especially in situations where there is no official guidance or where experience is lacking (because of the rarity of such events). Training at this level needs to facilitate creativity, problem-solving, feedback, self-reflection, and hindsight knowledge, building a pool of uncertainty management skills to fall back on when faced with unprecedented situations beyond the scope of protocol (or current expertise).

ABSTRACT
Redundant deliberation is a cognitively demanding form of inertia in which a decision-maker fails to gain any additional advantage by thinking about a problem compared to the risk of failing to act and deal with the problem. It most commonly occurs where there is no standard operating procedure (to help provide guidance) or where experience is lacking. This article argues that training interventions, including 'grim storytelling', must focus on supporting decision-makers' ability to imagine rare, high-impact events, and construct 'least–worst' scenarios to help them anticipate, prevent, mitigate, adapt to and recover from such threats.

You can't depend on your eyes when your imagination is out of focus (Mark Twain).

Alison (2019) describes 'redundant deliberation' (RD) as pathological hesitation due to overthinking a choice between difficult options. It occurs where there is no standard operating procedure (to provide guidance) and is intensified by the fact that decision-makers are not exposed to enough of these events to build up a repository of expert knowledge (Shortland & Alison, 2020). To help decision-makers build a 'library of experiences' (Matthews, 2013, p. 67), this article argues that training interventions should encourage decision-makers to imagine rare, high-impact events. To this end, we recommend a novel learning method that we call 'grim storytelling'. This entails imagining negative outcomes in which each narrative pathway results in a bad outcome. This act of imagination enables unique insights into how decision-makers organize priorities, seek solutions, and adapt under stress. This facilitates creativity, problem-solving, feedback, self-reflection, and hindsight knowledge. We argue that, in comparison with infrequent but long and expensive training sessions, the proposed short (about 45 minutes), but regular (for example weekly) act of grim storytelling will produce longer lasting and more desirable results.

In an ideal world, emergency responders would deal with completely predictable events. Standard operating procedures would enable the decision-maker to enact a series of steps to get things under control and resolved. However, there is often no protocol to guide decision-makers in 'critical incidents'. While the College of Policing defines a critical incident as 'any incident where the effectiveness of the police response is likely to have a significant impact on the confidence of the victim, their family and/or the community' (https://www.app.college.police.uk/app-content/critical-incident-management/types-of-critical-incident/), in this article we adopt a specific focus on critical incidents that are high-stakes, high-uncertainty and involve the decision-maker being presented with multiple, competing least–worst options. The next best thing to complete predictability and standard operating procedures would be the ability to draw upon extensive expertise. Ideally, experts would have had countless opportunities to learn what works in each case. The reality, though, is that the most catastrophic events have unique qualities (Taleb, 2008).

A persistent criticism levelled at some or all emergency services during responses to these critical incidents are a failure to act in time or even act at all (see for example Kerslake, 2017; Grenfell Tower, 2021). Although considerable effort has gone into developing guidance and standard operating procedures to enable officers to acquire expertise through repeated exposure, there has been a deficit of training methods to arm them to deal with the unexpected. This article argues that a process we call 'grim storytelling' can significantly reduce RD. We explain the concept, illustrate it with examples and cover potential benefits based on related evidence of learning through narratives and scenarios. We conclude that short (about 45 minutes), but regular (for example once a week) exposure to, and learning from, grim storytelling can complement

the more traditional decision-making training, preparing people to deal with the unexpected. Such training might reduce the time that people spend on overthinking their options when there is no policy and experience. This, in turn, should prepare them to make more cost-effective (in terms of human lives and financial resources) decisions.

Alison (2019) argues that, with respect to critical incident management, RD 'is the single most damaging decision-making failure'. RD occurs at the point where thinking tips into overthinking and where the benefit of calculating the cost of each option shows diminishing returns compared to simply picking one (or indeed any) of the options over doing nothing. RD leads to failing to act in time (or at all). Delay creates commercial damage to infrastructure, reputational damage to the individual decision-maker and their organization and further catastrophic loss of life.

Engaging in scenario-based training involves one's imagination to first create and then deal with worst-case events. Supported by goal-structured facilitation, the act of imagining 'grim stories' and then being forced to think through managing them would assist in predicting, adapting, and responding to, as well as mitigating such threats. Such approaches assist in inoculating decision-makers from what we have previously identified as a point of failure in critical incident response—namely decision inertia or failures to act. We also suggest that meaningful, context-driven narratives alongside goal directed training objectives can assist emergency responders to learn how to prepare for and prevent 'unimaginable' and 'unique' events.

Decision inertia and RD

Unlike other forms of inertia, RD is a very cognitively demanding process. Where Anderson's (2003) categories included the cognitively lazy act of avoiding, deferring, or delaying the process of dealing with a problem, RD is a cognitively very active, but ultimately self-defeating process. Power and Alison (2017) established that RD was especially disruptive to moving through critical incident decision phases and occurred in situations that were high-stakes, low-frequency and with high accountability. RD is closely linked with the process of sense-making. Sense-making is a motivated effort to understand connections that exist in the environment to anticipate future trajectories and act effectively (Klein et al., 2006). Sense-making is one of the fundamental roles of perception and cognition and, when it fails, the motivation to act can unravel—leaving the individual in a state of 'limbo'. Previous literature on sense-making highlighted how we do not make sense of the *entire* situation but, instead, need to prioritize certain concepts (at a gamble) to develop a clear picture (Klein et al., 2011). Furthermore, the source of most errors in decision-making stem from faulty (or a failure to update) our picture of the situation (Orasanu et al., 1998). RD stems from two distinct patterns of thinking that occur within the sense-making process. First, by perpetual requests for more and more information when it is evident that it simply was not available. In this sense, RD not only stems from the inability to establish situational awareness, but the inability to know that any further efforts to understand the situation are futile, and the decision-maker needs to move forward in their decision-making process. This concept of committing to the information that you have is not commonly conceptualized

within the literature on sense-making. Second, in instances where the decision-maker gets stuck in a cycle of prospectively modelling different futures based on a consideration of each of the possible options. Though anticipating likely outcomes of a given choice is normally a hallmark of good thinking, when a decision-maker gets stuck in an infinite loop of deliberation rather than action, they can end up making no contribution to bringing an event under control. It is then that the act of thinking creates a barrier to acting and it is then that the person supposed to be 'gripping' an incident simply becomes a bystander as events unfold in front of them.

Grim storytelling

Few people have the imagination for reality (Goethe).

The issue of failing to imagine has previously been associated with a lack of preparedness. Similar accounts were given in the US's report into the 9/11 attacks, in which the 9/11 Commission report specifically highlights the 'failure of imagination' (9/11 Commission, 2004, p. 336). Recommendations included the intriguing proposition that it is, 'crucial to find a way of routinizing, even bureaucratizing, the exercise of imagination' (9/11 Commission, 2004, p. 344). It is interesting to note, however, that despite the significant increase in scholarly research on terrorism after 9/11 (including preparedness and prevention of terrorism, and terrorist adaption Schuurman, 2018; Wirtz & Rohrbeck, 2017), there has been little research on the role of imagination in predicting, preparing, and responding to acts of terrorism. This is, again, even though imagination in intelligence work has been advocated since the late 1970s (for example Shackle, 1979, p. 88). Relatedly, even a 'post-mortem' analysis of 'grim' past threats, like Anthrax (or the 9/11 attacks) can yield invaluable insights into alternative scenarios (Bartlett, 1999). Perhaps even more bizarre were the director general of the World Health Organisation's remarks in relation to Covid-19: 'Six months ago none of us could have imagined how our world and our lives would be thrown into turmoil by this new virus' (WHO, 2020): an incredibly odd confession from an organization whose job it is to do engage directly in such a prospective act of forecasting.

Our grim storytelling method is based on learning through narratives and scenarios. Learner immersion involves engaging on an up-close and personal level, thrusting the learner to the centre of a dramatic high-stakes scenario where all available decisions entail different types of repercussions. Resembling a role-play, grim storytelling is deeply immersive; the learner imagines a specific place and time with real-time situations. Grim storytelling requires an urgent solution within which all available options carry some negative implications, providing us with insights into decision-making when facing the rarest and most unusual scenarios that normal training cannot prepare us for. Thus, grim storytelling is a resource-light, immersive and interactive learning method that can be conducted with relatively little technology and time, both formally and informally.

In relation to the goals of grim storytelling, the goal is not simply to allow people to *imagine* what may occur and thus, in advance, develop practices and policies to deal with them

(this would be closer to the concept of 'red teaming' where a group that plays the role of an enemy or competitor, and provides security feedback from that perspective). Instead, the goal is to allow individuals the opportunity to practise skills that will be useful in future scenarios that they do not have experience of; namely the ability to juggle incomplete situational awareness and overcome the tendency to redundantly seek more information, and the ability to juggle multiple least–worst options and commit to a choice. In this sense, grim storytelling is associated with the ability to transfer core decision-making skills, learnt through repeat exposure and training, onto a new and novel situation. Transference was originally defined as the extent to which a learnt response in one task (or situation) would influence the response within another task or situation (for example see Adams, 1987). Definitions of transference emphasize that transference consists of two dimensions:

- *Generalization*—the extent to which the knowledge or skill acquired in a training setting are applied to different settings, people, and/or situations.
- *Maintenance*—the extent to which changes that result from a learning experience persist over time (Blume et al., 2010).

Those who study the psychology of education and learning have long explored the issue of learning transference (Grose & Briney, 1963), frequently debating the nature, causes and prevalence of transfer (Barnett & Ceci, 2002). After Baldwin and Ford (1988) originally identified a 'transfer problem' in training research, there has been an outpouring of conceptual and research-based suggestions aimed at lessening the gap between learning and workplace performance. While estimates vary, the overall picture is bleak. Georgenson (1982) estimated that 10% of training results in a behavioural change. Saks (2002) found that 40% of trainees fail to transfer immediately after training, 70% fail to transfer after one year and, ultimately, only 50% of any training investment resulted in individual improvement. Hence, by using grim storytelling as a route to practise the process of making least–worst decisions (rather than applying a doctrinal standard operating procedure to a certain, predictable situation), decision makers will be better equipped to handle new and unpredictable situations without falling foul of classic inertia traps.

We base some of the theoretical grounds of the grim storytelling approach on the SAFE-T model (i.e. decision-making emphasizing naturalistic decision-making, its potential for cross-comparative analysis of incidents–see Alison et al., 2018). The model proposes that an optimal decision-making involves four key phases: Situation Assessment (SA), Plan Formulation (PF) and Plan Execution (PE), followed by an incremental and transitional team learning (T). Enriching the PF and PE with the role of imagination (Hayes & Maslen, 2015), we outline the following stages of grim storytelling based on past incidents: hindsight threat assessment; time horizon and immediate threat evaluation at the incident time; cognitive construction of alternatives; learner immersion; and learning. This process applies to both individual and group-focused decisional contexts.

The 'imagine' scenario exercises can be far simpler, informed by insiders' stories, and conducted in almost any setting in about 45 minutes and at a low cost (for example audio and video recording of the decision-maker's responses for subsequent analysis and reflection and feedback). This presents an attractive alternative or addition to (typically) expensive annual training exercises. Before we cover how grim storytelling operates and how it facilitates learning, let us consider the dilemma of RD and how it is framed against incident narratives.

Using one's imagination to develop grim story narratives is a compelling learning tool that can assist emergency responders in developing competency and confidence to respond to such 'unimaginable' situations. Storytelling enhances learning by embedding lessons into coherent narratives, allowing practitioners to push the boundaries of current situational models—even if those imagined events do not come to pass. Critical incidents are especially challenging because they are rare, chaotic, unexpected, dynamic, riddled with uncertainty and very high risk with unclear range of required responses often not covered by any protocol, which means that they are best studied in naturalistic, rather than lab, settings (Klein, 1993) or when visualization of problems is facilitated. Even individuals in elevated positions of seniority, and with many years of experience, will not have had enough exposure to dealing with such events to be considered experts. Even in training, learning, and development cycles it would be rare for senior officers to be exposed to more than one or two simulated training events per year (each of which might require two–three days each). The lack of opportunity for repeated exposure to training for hard events and learning complex adaptive technical skills would be akin to expecting an air traffic trainee controller to manage a novel and complex aviation incident. Educators and trainers under-utilize storytelling as a formal method of learning (Gottschall, 2012). Although training automatic high-level processes may seem onerous or nearly impossible, the source and common elements of experts' intuitive routines (expertise unpacking in interview-based vignette-grounded stories) can be identified and made available to facilitate intuitive expertise thus empowering imagination skills with foresight. Importantly, such expertise should be particularly honed within group, rather than individual, settings as crisis response is typically conducted in team contexts and command structures (although with the inherent risk of becoming disconnected from team and command). This, in turn, implies that attention should be paid to interactions between different actors with different views and information as a situation unfolds. Such interactions are likely to evoke strong emotions that play a key role in guiding attention and shifting frames (Vogus et al., 2014), meaning that training should also incorporate space for discussing and reflecting on emotional experience.

Benefits of learning through narrative

Narrative is an essential meaning-generating human activity that allows access to the personal experiences of the storyteller (Kramp, 2004). Narratives facilitate thought, interaction, and knowledge (Hinyard & Kreuter, 2007), with stories ubiquitous in life histories, myths, anecdotes, legends, and illustrations. Academics, on the other hand, recognize narratives in terms of cognition, comprehension, and explanation (Herman, 2000). Thus, learners can use

them particularly well when they are immersed in the story that is presented to them in a way that creates meaning on personal level (Cho et al., 2007), even where the presented situation is novel, ambiguous, and unexpected (Maitlis & Christianson, 2014). Narrative immersion creates a sense of transportation to other worlds that despite their recognition as simulation feel authentic enough to evoke emotions and thoughts normally experienced in real circumstances, albeit without consequences. This, in turn, can be entertaining, stimulating creativity and learning (Kangas, 2010). That sense of transformation also manifests in mental time travel that allows for imagined 'what if' past and future scenarios and their consequences, producing invaluable learning insights through 'safe simulations' (Suddendorf et al., 2011).

When in a state of immersion, this dualistic experience (knowing it is not real, but feeling that it is) enables narratives to powerfully change self-concepts, strengthen relationships, reduce prejudice, reduce loneliness, and enhance empathy. An immersive and engaging story arouses intense emotions, creates personal meanings, features universal qualities of human experience and achievement through conflict where pressure and risk are high (Storr, 2019). Stories serve as a simulation of our social world, which then enables us to revise plans and work with changeable, nuanced, and surprising situations (Mar & Oatley, 2008). They are the optimal vehicle for transferring expertise and allowing the learner to apply expertise in unprecedented settings. Immersion enhances learning in at least three different ways—allowing us to look at the same issue through multiple perspectives, helping us consider alternative scenarios, and developing transferable skills (Dede, 2009). This is also backed up by data from neuroscience, where readers immersed in a story create vivid mental simulations of sounds, sights, tastes, and movement by activating brain regions responsible for processing similar experiences in real life (Ryan, 2010; Wehbe et al., 2014).

According to narrative transportation theory, as people immerse themselves in a story, their attitudes and intentions adjust to reflect that story (Green & Brock, 2002). The theory suggests that one can enjoy the benefit of narrative immersion and its effects, like connections with characters and self-transformations without any repercussions (Green et al., 2004).

Transformative learning states that people revise and interpret meaning through stories (Taylor, 2008). Learning occurs across three levels: psychological (changes in understanding of the self); convictional (revision of belief systems); and behavioural (changes in decision-making). Learners consider alternative perspectives through narratives and question and potentially readjust and realign otherwise unconscious habits. Learners construct new knowledge by transforming previously unquestioned frames of reference and reconsidering ideas beliefs and values that would otherwise be automatically rejected (Mezirow, 1997). Further, because the learning takes a narrative form, self-feedback and argument are internally generated by the learner rather than imposed by the educator or trainer.

Learning through narrative enhances language, thinking, imagination and creativity skills (Wang et al., 2008). Using stories has also shown a positive effect in more traditional and common learning environments. For example, it can serve as an empowering experience for disabled students (Skouge & Rao, 2009), reducing children's prejudice toward the disabled (Cameron & Rutland, 2006), helping them overcome their fears, solve problems better and master basic social skills (Hakkarainen, 2009).

Narratives facilitate perspective-taking (Lawlor, 2000), which can be illustrated by the results of a study in which individuals with and without terrorism training took the role of a red team in the narrative scenario of terrorists planning an attack (Romyn & Kebbell, 2014). Such individuals were consistent in their target-selection ordering, and any prior military training did not influence the order. A thematically related study exploring the hypothetical results of a dirty bomb attack shed light on the consequences of various assumptions about preparedness, plans, and action (Bañuls et al., 2013). These results helped increase understanding about the factors that are involved in the definition of an emergency plan and how different actors participate in it. Thus, in our quest for igniting the imagination and creativity of learners, there are still some questions around the competing priorities between recreating fully immersive environments and the importance of focusing on engaging storytelling.

Supporting grim storytelling with evidence from scenario-based learning

Cyert and March (1963) found that managers' previous experience leads them to search for solutions in the previous problem spaces. These 'local searches' in past experiences lead to solutions that tend to be very similar to past solutions. Instead, innovation requires an 'action-based' decision-making style that emphasizes active search and engagement (Ford & Ogilvie, 1995; Ogilvie, 1998). This is in line with education research that has highlighted the important difference between 'telling' students and encouraging critical evaluation (Greenbank & Hepworth, 2008). Watts (2005, p. 69) argues that we should not be *telling* people, but helping them acquire knowledge, skills and attitudes that will help them handle future situations in which they are the autonomous agent.

Whereas learning through narrative is focused on getting people immersed in what has apparently already happened, scenario-based learning requires participants to care about the consequences of the choices they make (Frasca, 2003). Scenario-based learning involves a problem-based approach to learning and teaching and, unlike case studies, these situations are developed *bespoke* for different contexts to sensitize the learners about the content. When done right, the effects of scenario-based training have been detectable on a physiological level, producing heart rate patterns that were consistent with the elevated physiological stress produced by real-world policing shown in field research (Armstrong et al., 2014). This was also supported by a related study, showing that officer physiological stress to highly realistic scenario training was significantly correlated to the stress responses of active-duty police officers (Andersen et al., 2016).

Relatedly, it was found that prospective hindsight (i.e., if an event has already occurred) increased the correct identification of reasons for future outcomes by 30% (Mitchell et al., 1989). More recently, it has been argued

that one reason why projects fail at a spectacular rate, is people's reluctance to voice their reservations during the planning stage (Klein, 2007).

Benefits of scenario-based learning

Existing literature on the potential benefits of scenario-based learning is quite limited. Disastrous events, such as fires, tornadoes, hurricanes, terrorist incidents and chemical spills, require high-consequence decisions with incomplete or inaccurate information, ill-defined goals, and the pressures of time, and a constantly changing situation that experience and textbook training can help with only partially. Scenario-based training, on the other hand, appears to offer more effective planning and results management (Moats et al., 2008). Relatedly, a scenario-planning approach was found to be helpful in developing decision-making tools that can be used for flood emergency logistics management (Chang et al., 2007) and planning (Özdamar et al., 2004). In a study on nuclear emergencies, a scenario-based modelling approach helped provide optimal routes to maximize evacuation (Lv et al., 2013). Such modelling helped assess the effectiveness of different flood (Simonovic & Li 2003), rainstorm (Yin et al., 2011), cyclone, fire, and earthquake (Spence et al., 2007) emergency procedures.

In the dynamically changing military context, scenario-based training was found to facilitate transfer of learning and knowledge across situations and roles, thus accelerating and retaining expertise (Hoffman et al., 2013). Similar scenarios have been used in enhancing the skills of navy (Grassi, 2000) and aircrew (Prince et al., 1993), as well as medical emergency personnel (Treloar, 2001). Although there might be some ecological validity concerns regarding the possibility that scenario simulations may potentially encourage trainees to take more risks on the 'no harm done in the exercise' basis, such risks can also be methodologically controlled if the 'hardiness level' of the simulation is increased by rewarding more cautions approaches or if the trainees are later invited to reflect on, and discuss, alternative 'what if' outcomes. Scenario simulations have already helped student police officers develop subject-specific policing knowledge, as well as higher level skills, such as decision-making, problem-solving and collaboration (Werth, 2011). They also assisted FBI recruits in learning defensive tactics, interview methods, handcuffing, rules of evidence, and constitutional law, providing them with a better understanding of how investigations are conducted from start to finish (Whitcomb, 1999). Scenario simulations were found useful in designing peace and conflict exercises (Bartels et al., 2013) and early detection of suicide warning signals (Madson & Vas, 2003).

Scenario-based learning can improve planning in volatile environments (Miesing & Van Ness, 2007) and accelerate expertise. Its more engaging and contextualized nature (Herrington et al., 2003) facilitates the development of critical thinking skills (Cant & Cooper, 2010), as well as critical assessment and management skills (Steadman et al., 2006). Its immersive nature improves interaction (Morton & Jack, 2005), enhancing student learning (Niemer et al., 2010), interest and achievement (Hwang & Chang, 2011), as well as problem-solving skills (Iqbal & Every, 2005) and teamwork (Nagle et al., 2009).

Rather than being beneficial just to individuals, scenario-based learning appears to facilitate group decision-making (Gremler, 2004), design decisions (Liu et al., 2012), as well as the management of complex environments (Kirkley & Kirkley, 2005), and urban and regional planning (Zapata & Kaza, 2015). The work in progress on scenario-based counter-terrorism suspect interviewing is also showing promising results in accelerating the generation of more accurate and richer intelligence (Morgan et al., 2020).

Limitations of learning through narrative

While there is extensive practice on the role of 'stories' in organizational preparedness, (Anderson, 1995), the conclusions can, if unguarded, compound rather than solve problems. Such conclusions are based on learning from past events and involve identifying direct parallels between previous events and a current event to predict the likely outcomes (Perrotta et al., 2013). In the assessments of Al-Qaeda, for example, prior to 9/11 it was held that plane hijackings were *usually* used to negotiate. Similarly, we can see evidence of analogical decision-making in the UK's reliance on Prime Minister Neville Chamberlain's appeasement of Hitler in the 1930s as an erroneous case to compare to and then confront Saddam Hussein in the invasion of Iraq in 2003 (a war-time threat narrative from the past applied to a completely different and almost culturally alien context of the Middle East). And then, in a continuation of this erroneous reasoning, the alleged threat that Hussein posed (a 'premature march to war' narrative) was then used by Ed Miliband to prevent the British military intervention in Syria, the reasoning being unclear intelligence data and a potentially catastrophic spill-over effect.

At the same time, continuous flyovers by Russian strategic bombers approaching British airspace added weight behind the controversial decision to renew the British nuclear weapons system. Given the historical record of how military conflicts involving large powers with potent (for example chemical) weapons of mass destruction develop and pan out (for example the story of the fanatically resistant Japanese Imperial Army and the US Army), it is clear that no weapons are too devastating (for example skin-burning napalm deployed on Vietnamese women and children) to be used; the narrative history shows that all types of developed weapons have been used sooner rather than later. Thus, the argument used by advocates of nuclear armament that the principle of mutually-assured destruction (grounded in repeatedly disproven models of rational decision-making) makes the world safer may be deeply flawed.

As with all forms of learning, both narrative and scenario-based learning can be problematic and lead to unintended outcomes. Increased experience (Heimeriks, 2010) and past successes (Daniel & Hirshleifer, 2015) can result in overconfident and overly risky decisions. For example, physicians, just like other people (including commanders) rely on heuristics to fill in the blanks with their own ad hoc explanations—inferences that fit the data but that rely on tenuous or spurious correlations (Berner & Graber, 2008). As their confidence increases, the felt need for checking and updating their knowledge decreases in a reinforcing cycle (Rudolph & Morrison, 2008). Such superstitious learning,

which can be defined as a phenomenon related to the joint development of competence and the development of confidence in one's competence can arise from the accumulation of experience coupled with one's direct involvement in the task execution (Lejarraga & Gonzalez, 2011). It also occurs when the environmental activity and change is misunderstood, and therefore unrelated to (although not unaffected by) one's inferences and activities (Henderson, 1997). Although both narrative and scenario-based learning are compounded by issues of ecological validity (Levitt & March, 1988), superstitious learning, which thrives on time delays and ambiguity, can be mitigated by active real-time feedback and greater learner immersion (Rudolph & Morrison, 2008).

Conclusions

The multiple and ever-changing threats to public safety cannot be consistently and successfully tackled by a study of past critical incidents alone. Although their archival analysis can help generate insights, the hindsight effect, linear timeline, and availability of all the vital details behind the apparent, but often illusory, cause and effect clearly limit the spectrum of solutions required for ambiguous, uncertain, and real-time situations. This means that once a coherent chain of events (storyline) has unfolded, it is difficult to deviate from it and prepare for the unexpected (Murata & Matsushita, 2014; Palasinski, 2011), which hinders learning and management of novel threats. Thus, the role of imagination is vital, and stories can nurture the ability to envision possible outcomes (Hayes & Maslen, 2015). Grim storytelling facilitates the consideration of multiple timelines, as well as management of uncertainty, mixed signals, clashing objectives and competing interests, oftentimes against the clock and under pressure.

Grim storytelling can provide decision-makers with a powerful, easily upgradable, and flexible tool for the management of new and still-to-emerge critical threats by regular exposure to deeply immersive real-time, interactive, and high-stakes verbal scenarios requiring urgent solutions and management of conflicting interests. We also suggest that grim storytelling facilitates learning best if it is regular (for example one session per week), of sufficient duration (about 45 minutes) and with intensive commitment (of sufficient intensity to feel demanding). Moreover, sessions need focus (what specific decisions need to be examined), form (what behaviours need to be considered) and feedback (with trained facilitators). Regularity and duration require senior officer buy in, and leadership and intensity are likely to be strongly influence by the skills of the facilitators in encouraging plausibly immersive least–worst scenarios. The spectrum of these storylines might be widest if they are developed in a variety of ways, like brainstorming, focus groups, analysis of past incidents with and without added twists, as well as creative exercises stimulating lateral thinking. This, in turn, will allow practitioners to imagine the unexpected and train for it more effectively. Such cost-effective learning will stimulate 'thinking out-of-the-box' problem-solving, perspective-taking, and coping with pressure associated with the stakes involved, possible repercussions and time constraints, thus, saving human and financial resources.

References

Adams, J. A. (1987). Historical review and appraisal of research on the learning, retention, and transfer of human motor skills. *Psychological Bulletin*, 101(1), 41–74. https://doi.org/10.1037/0033-2909.101.1.41.

Alison, L. (2019). Decision inertia and failures to act. Presented at the Annual conference of the OU Centre for Policing.

Alison, L., Palasinski, M., Waring, S., Humphrey, A., Humann, M., Shortland, N., & Bowman Grieve, L. (2018). Between a rock and a hard place of geopolitically sensitive threats–critical incidents and decision inertia. *Behavioral Sciences of Terrorism and Political Aggression*, 10(3), 207–224.

Andersen, J., Pitel, M., Weerasinghe, A., & Papazoglou, K. (2016). Highly realistic scenario based training simulates the psychophysiology of real world use of force encounters: Implications for improved police officer performance. *Journal of Law Enforcement*, 5(4).

Anderson, P. (1995) The biggest mutual aid system on earth: The internet in emergency management. *National Coordinating Council on Emergency Management Bulletin* 1: 7–9.

Anderson, C. (2003). The psychology of doing nothing: Forms of decision avoidance result from reason and emotion. *Psychological Bulletin*, 129, 139–167.

Armstrong, J., Clare, J., & Plecas, D. (2014). Monitoring the impact of scenario-based use-of-force simulations on police heart rate: Evaluating the royal Canadian mounted police skills refresher program. *Journal of Criminology, Criminal Justice, Law & Society*, 15, 51.

Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology*, 41, 63–105.

Bañuls, V. A., Turoff, M., & Hiltz, S. R. (2013). Collaborative scenario modeling in emergency management through cross-impact. *Technological Forecasting and Social Change*, 80(9), 1756–1774.

Barnett, S. M., & Ceci, S. J. (2002). When and where do we apply what we learn? A taxonomy for far transfer. *Psychological Bulletin*, 128, 612–637.

Bartels, E., McCown, M., & Wilkie, T. (2013). Designing peace and conflict exercises: Level of analysis, scenario, and role specification. *Simulation & Gaming*, 44(1), 36–50.

Bartlett, J. G. (1999). Applying lessons learned from anthrax case history to other scenarios. *Emerging Infectious Diseases*, 5(4), 561.

Berner, E. S., & Graber, M. L. (2008). Overconfidence as a cause of diagnostic error in medicine. *The American Journal of Medicine*, 121(5), S2–S23.

Blume, B. D., Ford, J. K., Baldwin, T. T., & Huang, J. L. (2010). Transfer of training: A meta- analytic review. *Journal of Management*, 36, 1065–1105.

Cameron, L., & Rutland, A. (2006). Extended contact through story reading in school: Reducing children's prejudice toward the disabled. *Journal of Social Issues*, 62(3), 469–488.

Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: Systematic review. *Journal of Advanced Nursing*, 66(1), 3–15.

Chang, M. S., Tseng, Y. L., & Chen, J. W. (2007). A scenario planning approach for the flood emergency logistics preparation problem under uncertainty. *Transportation Research Part E: Logistics and Transportation Review*, 43(6), 737–754.

Cho, S., Holyoak, K. J., & Cannon, T. D. (2007). Analogical reasoning in working memory: Resources shared among relational integration, interference resolution, and maintenance. *Memory & Cognition*, 35(6), 1445–1455.

9/11 Commission. (2004). *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks upon the United States*. https://www.govinfo.gov/app/details/GPO-911REPORT.

Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Prentice-Hall.

Daniel, K., & Hirshleifer, D. (2015). Overconfident investors, predictable returns, and excessive trading. *Journal of Economic Perspectives*, 29(4), 61–88.

Dede, C. (2009). Immersive interfaces for engagement and learning. *Science*, 323(5910), 66–69.

Ford, C. M., & Ogilvie, D. (1995). An Action-Based Alternative to Traditional Management Education. Paper presented at the 1995 Annual Academy of Management Meeting, Vancouver, Canada.

Frasca, G. (2003). Simulation versus narrative. In M. Wolf, & B. Perron (Eds.), *The video game theory reader*. Routledge.

Georgenson, D. L. (1982). The problem of transfer calls for partnership. *Training & Development Journal*, *36*(10), 75–78.

Gottschall, J. (2012). *The storytelling animal: How stories make us human*. Houghton Mifflin Harcourt.

Grassi, C. R. (2000). *A task analysis of pier side ship-handling for virtual environment ship-handling simulator scenario development* (Doctoral dissertation, Naval Postgraduate School).

Grenfell Tower. (2021). https://www.grenfelltowerinquiry.org.uk/

Green, M. C., & Brock, T. C. (2002). In the mind's eye: Transportation-imagery model of narrative persuasion. In M. C. Green, J. J. Strange, & T. C. Brock (Eds.), *Narrative impact: Social and cognitive foundations* (pp. 315–341). Lawrence Erlbaum Associates Publishers.

Green, M. C., Brock, T. C., & Kaufman, G. F. (2004). Understanding media enjoyment: The role of transportation into narrative worlds. *Communication Theory*, *14*(4), 311–327.

Greenbank, P., & Hepworth, S. (2008). Improving the career decision-making behaviour of working class students: Do economic barriers stand in the way? *Journal of European Industrial Training*, *32*(7), 492–509.

Gremler, D. D. (2004). The critical incident technique in service research. *Journal of Service Research*, *7*(1), 65–89.

Grose, R. F., & Briney, R. C. (1963). *Transfer of learning: An enduring problem in psychology*. Van Nostrand.

Hakkarainen, K. (2009). A knowledge-practice perspective on technology-mediated learning. *Computer Supported Learning*, *4*, 213–231.

Hayes, J., & Maslen, S. (2015). Knowing stories that matter learning for effective safety decision-making. *Journal of Risk Research*, *18*(6), 714–726.

Heimeriks, K. H. (2010). Confident or competent? How to avoid superstitious learning in alliance portfolios. *Long Range Planning*, *43*(1), 57–84.

Henderson, S. (1997). Black swans don't fly double loops: The limits of the learning organization? *The Learning Organization*, *4*(3), 99–105.

Herman, D. (2000). Narratology as a cognitive science. *Image and Narrative*, *1*(1).

Herrington, J., Oliver, R., & Reeves, T. C. (2003). Patterns of engagement in authentic online learning environments. *Australasian Journal of Educational Technology*, *19*(1), 59–71.

Hinyard, L. J., & Kreuter, M. W. (2007). Using narrative communication as a tool for health behavior change: A conceptual, theoretical, and empirical overview. *Health Education & Behavior*, *34*(5), 777–792.

Hoffman, R. R., Ward, P., Feltovich, P. J., DiBello, L., Fiore, S. M., & Andrews, D. H. (2013). *Accelerated expertise: Training for high proficiency in a complex world*. Psychology Press.

Hwang, G. J., & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, *56*(4), 1023–1031.

Iqbal, R., & Every, P. (2005). Scenario based method for teaching, learning and assessment. In *Proceedings of the 6th conference on Information technology education* (pp. 261-266). ACM.

Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking Skills and Creativity*, *5*(1), 1–15.

Kerslake. (2017). *The Kerslake Report: An independent review into the preparedness for, and emergency response to, the Manchester Arena attack on 22nd May 2017*. https://www.jesip.org.uk/uploads/media/Documents%20Products/Kerslake_Report_Manchester_Are.pdf.

Kirkley, S. E., & Kirkley, J. R. (2005). Creating next generation blended learning environments using mixed reality, video games and simulations. *TechTrends*, *49*(3), 42–53.

Klein, G. (2007). Performing a project premortem. *Harvard Business Review*, *85*(9), 18–19.

Klein, G. A. (1993). A recognition-primed decision (RPD) model of rapid decision-making. In *Decision making in action: Models and methods*. Ablex Publishing Corporation.

Klein, G., Moon, B., & Hoffman, R. R. (2006). Making sense of sensemaking 1: Alternative perspectives. *IEEE Intelligent Systems*, *21*(4), 70–73. July-Aug. doi: 10.1109/MIS.2006.75.

Klein, G., Snowden, D., & Pin, C. L. (2011). *Anticipatory thinking. informed by knowledge: Expert performance in complex situations*. Pyschology Press.

Kramp, M. K. (2004). Exploring life and experience through narrative inquiry. In *Foundations for research: Methods of inquiry in education and the social sciences*. Routledge.

Lawlor, C. M. M. (2000). Learning from stories: Narrative interviewing in cross-cultural research. *Scandinavian Journal of Occupational Therapy*, *7*(1), 4–14.

Lejarraga, T., & Gonzalez, C. (2011). Effects of feedback and complexity on repeated decisions from description. *Organizational Behavior and Human Decision Processes*, *116*(2), 286–295.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Review of Sociology*, *14*(1), 319–338.

Liu, Z. L., Zhang, Z., & Chen, Y. (2012). A scenario-based approach for requirements management in engineering design. *Concurrent Engineering*, *20*(2), 99–109.

Lv, Y., Huang, G. H., Guo, L., Li, Y. P., Dai, C., Wang, X. W., & Sun, W. (2013). A scenario-based modeling approach for emergency evacuation management and risk analysis under multiple uncertainties. *Journal of Hazardous Materials*, *246*, 234–244.

Madson, L., & Vas, C. J. (2003). Learning risk factors for suicide: A scenario-based activity. *Teaching of Psychology*, *30*(2), 123–126.

Maitlis, S., & Christianson, M. (2014). Sensemaking in organizations: Taking stock and moving forward. *Academy of Management Annals*, *8*(1), 57–125.

Mar, R. A., & Oatley, K. (2008). The function of fiction is the abstraction and simulation of social experience. *Perspectives on Psychological Science*, *3*(3), 173–192.

Matthews, M. (2013). *Headstrong: How psychology is revolutionizing war*. Oxford University Press.

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, *1997*(74), 5–12.

Miesing, P., & Van Ness, R. K. (2007). Exercise: Scenario planning. *Organization Management Journal*, *4*(2), 148–167.

Mitchell, D. J., Edward Russo, J., & Pennington, N. (1989). Back to the future: Temporal perspective in the explanation of events. *Journal of Behavioral Decision Making*, *2*(1), 25–38.

Moats, J. B., Chermack, T. J., & Dooley, L. M. (2008). Using scenarios to develop crisis managers: Applications of scenario planning and scenario-based training. *Advances in Developing Human Resources*, *10*(3), 397–424.

Morgan, R., Alison, L., Palace, M., Shortland, N., & Humann, M. (2020). The effects of intelligence and personality on performance in simulated interrogation scenarios. *Journal of Police and Criminal Psychology*, https://doi.org/10.1007/s11896-020-09411-0.

Morton, H., & Jack, M. A. (2005). Scenario-based spoken interaction with virtual agents. *Computer Assisted Language Learning*, *18*(3), 171–191.

Murata, A., & Matsushita, Y. (2014). Hindsight bias in cause analysis of accident. *Psychology Research*, *4*(11), 843–851.

Nagle, B. M., McHale, J. M., Alexander, G. A., & French, B. M. (2009). Incorporating scenario-based simulation into a hospital nursing education program. *Journal of Continuing Education in Nursing*, *40*(1), 18–25.

Niemer, L., Pfendt, K., & Gers, M. (2010). Problem-based learning in nursing education: A process for scenario development. *Nurse Educator*, *35*(2), 69–73.

Ogilvie, D. T. (1998). Creative action as a dynamic strategy: Using imagination to improve strategic solutions in unstable environments. *Journal of Business Research*, *41*, 49–56.

Orasanu, J., Martin, L., & Davison, J. (1998). *Errors in aviation decision-making: Bad decisions or bad luck*. Paper presented at the Fourth Conference on Naturalistic Decision Making, Warrenton.

Özdamar, L., Ekinci, E., & Küçükyazici, B. (2004). Emergency logistics planning in natural disasters. *Annals of Operations Research*, *129*(1), 217–245.

Palasinski, M. (2011). The experiment-based knew-it-all-along effect in the qualitative light of narrativity. *Qualitative Report*, *16*(2), 441–463.

Perrotta, C., Featherstone, G., Aston, H., & Houghton, E. (2013). *Game-based learning: Latest evidence and future directions*. NFER.

Power, N., & Alison, L. (2017). RD about negative consequences: Decision inertia in emergency responders. *Psychology, Public Policy, and Law*, *23*(2), 243.

Prince, C., Oser, R., Salas, E., & Woodruff, W. (1993). Increasing hits and reducing misses in CRM/LOS scenarios: Guidelines for simulator scenario development. *International Journal of Aviation Psychology*, *3*(1), 69–82.

Romyn, D., & Kebbell, M. (2014). Terrorists' planning of attacks: A simulated 'red-team' investigation into decision-making. *Psychology, Crime & Law*, *20*(5), 480–496.

Rudolph, J. W., & Morrison, J. B. (2008). Sidestepping superstitious learning, ambiguity, and other roadblocks: A feedback model of diagnostic problem-solving. *The American Journal of Mmedicine*, 121 (5), S34–S37.

Ryan, M. L. (2010). Narratology and cognitive science: A problematic relation. *Style*, 44(4), 469–495.

Saks, A. M. (2002). So what is a good transfer of training estimate? A reply to fitzpatrick. *The Industrial-Organizational Psychologist*, 39, 29–30.

Schuurman, B. (2018). Research on terrorism, 2007–2016: A review of data, methods, and authorship. *Terrorism and Political Violence*, 1–16.

Shackle, G. L. S. (1979). *Imagination and the nature of choice (p. 13)*. Edinburgh University Press.

Shortland, N., & Alison, L. (2020). Colliding sacred values: A psychological theory of least–worst option selection. *Thinking & Reasoning*, 26(1), 118–139. DOI: 10.1080/13546783.2019.1589572

Simonovic, S. P., & Li, L. (2003). Methodology for assessment of climate change impacts on large-scale flood protection system. *Journal of Water Resources Planning and Management*, 129(5), 361–371. doi: 10.1061/(ASCE)0733-9496(2003)129:5(361)

Skouge, J. R., & Rao, K. (2009). Digital storytelling in teacher education: Creating transformations through narrative. *Educational Perspectives*, 42, 54–60.

Spence, R., So, E., Ameri, G., Akinci, A., Cocco, M., Cultrera, G., … Zonno, G. (2007). *Earthquake disaster scenario prediction and loss modelling for urban areas*. http://www.earth-prints.org/handle/2122/3421.

Steadman, R. H., Coates, W. C., Huang, Y. M., Matevosian, R., Larmon, B. R., McCullough, L., & Ariel, D. (2006). Simulation-based training is superior to problem-based learning for the acquisition of critical assessment and management skills. *Critical Care Medicine*, 34(1), 151–157.

Storr, W. (2019). *The science of storytelling*. William Collins.

Suddendorf, T., Addis, D. R., & Corballis, M. C. (2011). Mental time travel and the shaping of the human mind. *Philosophical Transactions of the Royal Society B*, 10.1098/rstb.2008.0301.

Taleb, N. N. (2008). *The black swan*. Penguin Books.

Taylor, E. W. (2008). Transformative learning theory. *New Directions for Adult and Continuing Education*, 2008(119), 5–15.

Treloar, D. (2001). On-site and distance education of emergency medicine personnel with a human patient simulator. *Military Medicine*, 166(11), 1003.

Vogus, T. J., Rothman, N. B., Sutcliffe, K. M., & Weick, K. E. (2014). The affective foundations of high reliability organizing. *Journal of Organizational Behavior*, 35(4), 592–596.

Wang, D., Li, J., Zhang, J., & Dai, G. (2008). A pen and speech-based storytelling system for Chinese children. *Computers in Human Behavior*, 24(6), 2507–2519.

Watts, A. G. (2005). Career guidance policy: An international review. *The Career Development Quarterly*, 54(1), 66–76.

Wehbe, L., Murphy, B., Talukdar, P., Fyshe, A., Ramdas, A., & Mitchell, T. (2014). Simultaneously uncovering the patterns of brain regions involved in different story reading subprocesses. *PloS one*, 9(11), e112575.

Werth, E. P. (2011). Scenario training in police academies: Developing students' higher-level thinking skills. *Police Practice and Research*, 12 (4), 325–340.

Whitcomb, C. (1999). Scenario-based training at the FBI. *Training & Development*, 53(6), 42–47.

WHO. (2020). https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19—29-june-2020.

Wirtz, P. W., & Rohrbeck, C. A. (2017). Social influence and cognitive-motivational effects on terrorism preparedness: A hurdle model. *Health Education Journal*, 76(4), 385–397.

Yin, J., Xu, S., & Wen, J. (2011). Community-based scenario modelling and disaster risk assessment of urban rainstorm waterlogging. *Journal of Geographical Sciences*, 21(2), 274–284.

Zapata, M. A., & Kaza, N. (2015). Radical uncertainty: Scenario planning for futures. *Environment and Planning B: Planning and Design*, 42(4), 754–770.