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RESEARCH

Virtue, choice, and storytelling: how ethics, decision modalities and narrative framing influence decision inertia in a 360 degree extended reality environment

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Abstract
The phenomenon of decision inertia, has been identified as a critical factor towards sub-optimal decision-making in high-stakes situations. Examined through the lens of Bayesian updating, virtue ethics, and cognitive-experiential self-theory, this research investigated the influence of deontological versus consequentialist narratives and rational versus experiential decision modalities on participants' decision-making behaviours in high-pressure situations. A total of 119 participants took part in an extended reality scenario study designed to provoke high-stakes ethical decision-making. The study juxtaposed grim storytelling narratives against traditional ethical frameworks, aiming to reveal their respective impact on decision inertia amid uncertain conditions. The findings reveal that narrative framing significantly altered decision-making outcomes. Specifically, grim narratives, which presented consequentialist outcomes, were found to significantly reduce decision inertia. Rational decision-making modalities did not significantly predict decision inertia. In contrast, experiential modalities were associated with heightened levels of decision inertia, which suggests a potential vulnerability to hesitation in crisis situations. The exploration into narrative framing further uncovered that grim storytelling effectively counteracted decision inertia. This effect contrasted with non-grim narratives, where the absence of consequence led to a diminished urgency in decision-making. These findings highlight the complexity between cognitive mechanisms, ethical reasoning, and narrative context in shaping decision inertia and decision outcomes. The implications extend to emergency response training and policy development, advocating the strategic use of narrative framing and ethical orientation to enhance decision-making efficacy. This research also underscores the potential of immersive simulations and narrative strategies to foster more decisive and ethically grounded decision-making in high-pressure environments.

Keywords Decision-making · Narrative Framing · Ethics · Morality · Emergency · Terrorism

1 Introduction

The study of decision-making psychology in high-pressure, extreme environments (e.g., military operations, counterterrorism efforts, and emergency response situations) has highlighted the phenomenon of decision inaction, also referred to as decision inertia (Power & Alison 2018). This has been characterised by a reluctance or inability to act decisively, often with severe consequences. Research has demonstrated that inertia can arise from a failure to imagine the most severe outcomes (e.g., a fire completely overwhelming a city; Grenfell, (Grenfell 2021)), failure to respond adequately to emergent telltale signs (e.g., the 7 October Hamas attack on Israel, Hitman 2024) and a reluctance to commit to radical measures (e.g., initiating a full-scale evacuation; Alison et al. 2015; Shortland & Alison 2020; Shortland et al. 2018, 2019; van den Heuvel et al. 2012). The consequences of indecision and hesitation can be catastrophic, which is evident in the aftermath of the Grenfell Tower incident (Lane 2017) or the murdered, tortured and kidnapped Israelis (Hirschfeld 2024).

However, despite widespread interest across various disciplines in understanding decision-making processes, there is a gap in research focused on the absence of decision-making,

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particularly in situations demanding immediate action (Anderson 2003). The concept of *least-worst* decisions, seen in naturalistic decision-making research (e.g., Alison et al. 2015), has shown scenarios where all options have negative outcomes, making quick decisions challenging, leading to decision inertia (Power & Alison 2017a, 2017b). This form of inertia demands considerable cognitive effort and differs from decision avoidance, where decisions are delayed or ignored (Anderson 2003). Yet the cognitive processes driving this form of decision inertia, under uncertainty, remains largely unexplored (Alison et al. 2015; May et al. 2023; Power & Alison 2017a, 2017b; van den Heuvel et al. 2012).

While often used interchangeably with omission bias or decision avoidance, *decision inertia* is a distinct construct. Unlike omission bias, where individuals favour inaction over action to avoid responsibility (e.g., Ritov & Baron 1990. Also see, Spranca et al. 1991 for more detail on omission bias), or decision avoidance, where decisions are actively deferred or ignored (Anderson 2003) decision inertia describes a conflicted state in which action is desired or required but inhibited by internal cognitive-affective factors. It is characterised by anticipatory regret, moral dissonance, or excessive risk aversion, especially under conditions of uncertainty or moral pressure (Alison et al. 2015; Power & Alison 2017a, b). Thus, inertia is not the absence of decision-making due to neglect, but the result of an internal struggle that precludes timely action despite awareness of its necessity. Thissuggests a need for empirical research to understand which individual factors might lead to the experience of decision inertia, while others proceed decisively. This study, therefore, offers an empirical analysis of three cognitive factors potentially contributing to decision inertia and introduces a practical, action-oriented strategy for reducing decision inertia.

1.1 Bayesian updating: adaptive decision-making under uncertainty

Bayesian updating, widely seen in economic theory and decision-making under uncertainty, intersects with Expected Utility theory (Charness & Levin 2005) forming the foundation of dynamic risk assessment strategies. This method, fundamentally based on Bayes' rule, provides a structured approach to modify initial beliefs or predictions in light of new evidence or outcomes observed from the actual events. It is a process that quantitatively balances prior assumptions, with new data leading to revised, more accurate posterior beliefs (Wolpert & Ghahramani 2005). In the context of high-stakes events, the relevance of Bayesian updating extends beyond theoretical economics into practical decision-making. Just as Bayes' rule directs the adjustment of prior beliefs with emerging evidence in economic models, emergency responders apply similar principles to dynamically assess risks and make informed decisions under uncertainty. This adaptive approach is critical for responding effectively to dynamic and evolving situations, where initial assessments must be continuously updated as new information becomes available (e.g., Charness & Levin 2005).

Despite its theoretical relevance, research in economics and psychology (e.g., Kahneman & Tversky, 1972, (Kahneman, and Tversky, 1973)), highlights a gap between ideal Bayesian behaviour and actual human decision-making. For example, studies have shown that individuals, including those in experimental settings, often deviate from Bayes' rule, leaning instead towards heuristic evaluations based on similarity to known examples (Grether 1980, 1992; Ouwersloot et al. 1998; Zizzo et al. 2000). Thus, while Bayesian updating offers a powerful tool for revising risk assessments based on new data, the natural tendency of individuals to rely on known examples and rely on heuristics rather than strict Bayesian analysis could influence the effectiveness of emergency decisions. For instance, Alós-Ferrer et al. (2016) found that a strong disposition towards convergency was a key precursor to decision inertia within decision-making processes. They observed that individuals with a marked preference for consistency were more likely to make the same decisions repeatedly, disregarding the consequences or the possibility of suboptimal outcomes. Further, Alós-Ferrer et al. (2016, 2017) identified a link between a prevention focus, induced by situational factors, and less optimal belief updating. This was particularly evident where decision tasks were presented in a success/failure feedback format, leading to higher error rates in a dual-choice belief-updating scenario.

As such, the current study explores the process of Bayesian decision-making, specifically when faced with multiple options, each with a potential for either success or failure. This study operates under the principle that while the value of each potential outcome is established, decisions are made under conditions of uncertainty—specifically, without precise probabilities for the success of each option. This lack of probabilistic clarity renders the decision-making challenge complex, as the inability to determine the likelihood of success leaves the process without a clear path to optimisation. The evaluation of any decision-making strategy's efficacy is contingent upon the existence of a known distribution of potential success probabilities (e.g., Vieidier 2024). When decision-makers are aware of this distribution, their decision-making process might follow a Bayesian framework, treating the known distribution as a preliminary *prior* and refining it with incoming data to enhance decision accuracy (Afrabandpey et al. 2020; McNamara & Houston 1980).

In scenarios where this distribution remains unknown, there exists the possibility to construct an approximate model. This approach shows the critical role of understanding underlying probability distributions in navigating

decisions under ambiguity, highlighting the Bayesian method's utility in deriving optimal outcomes through the iterative updating of beliefs based on new evidence. It is, however, important to recognise that the process of optimal decision-making extends beyond the mathematics of priors and probability distributions (Kunreuther et al. 2002). At its core, the Bayesian approach, intersects with virtue ethics (Alfano 2011). This perspective emphasises the importance of moral character and the virtues that guide decision-making, suggesting that effective decision-making is not solely dependent on quantitative assessments or the mechanical application of Bayesian updating. Instead, it is influenced by ethical principles that govern the conduct and choices of the decision-maker (see Dempsey et al. 2023).

1.2 The ethics of emergency response

The ethical considerations for emergency response teams draw from both consequentialist and deontological theories (Maile et al. 2023), reflecting the broad applicability of these philosophical approaches in the context of emergency response. The nature of emergency response, which often involves following specific protocols (e.g., Standard Operating Procedures; see, Kerslake Report 2018) while also ensuring the safety and well-being of individuals and communities, necessitates a principled approach suggestive of deontological ethics (Dempsey et al. 2023). Deontological approaches as such are here defined as decisions in terms of an individual following overall the rules protocols of an operation, however those protocols might contain utilitarian based rules, whereas the decision of the individual to follow them can be classed as deontological. However, the challenge arises in the practical application of these ethics, given the diverse and complex scenarios responders face. The reliance solely on rigid rules and protocols appear to promote a rigid or unthinking adherence to procedures (May et al. 2023), limiting adaptability that are critical in emergency response scenarios. This approach could also hinder moral reasoning by oversimplifying the multi-faceted nature of high-stakes incidents.

In order to mitigate the complexity in applying ethical principles in high-stakes incidents, there has been significant reform over the last 30 years (e.g., Civil Contingencies Act 2004) to enhance operational response and practice. However, simply adapting and increasing regulations does not effectively enhance professional practices within emergency response (Schwartz & Sharpe 2010; Wood 2020). Nonetheless, the role of deontological ethics cannot be entirely dismissed, as emergency responders serve as the custodians of public safety. At the same time, the aim of achieving the *greatest good* supports emergency response ethics with consequentialist thought. This is evident, for instance, in the decision-making process during emergencies, where outcomes that leads to an overall benefit for the largest number is a priority.

For instance, consequentialist reasoning in emergency contexts must also attend to whose consequences are being weighed—those of the source of harm (e.g., the perpetrator), the target (e.g., victims or the public), or the responder themselves. Actions that benefit the collective may still impose severe costs on individual actors, raising ethical tensions between utilitarian efficiency and individual right (e.g., *prison dilemma*; see, Elster 1985). Moreover, moral relativism complicates the interpretation of consequences: what one stakeholder views as ethically justified (e.g., sacrificing a perpetrator to save hostages), another may view as morally impermissible (i.e., a relativistic perspective can undermine the idea of ethical critique and progress; Tasioulas 1998. Also see, Freeman et al., (Freeman, et al., 2009)). Thus, despite these cautions, Wood (2020) argued against a complete shift away from consequentialism in the ethics of emergency services. As such, the integration of virtue ethics with consequentialist and deontological reasoning remains an important consideration.

1.3 A case for virtue ethics: deontological vs. consequentialist approaches

Virtue ethics, consequentialism, and deontology represent the three principal ethical theories that inform not only the broad spectrum of ethical philosophy but also professional ethics (e.g., Larkin & Arnold 2003; Leider et al. 2017; Löfquist 2018). Virtue ethics, therefore, emphasises the development of moral character though virtuous actions (e.g., Larkin & Arnold 2003; Maile et al. 2023). Consequentialism, on the other hand, evaluates the morality of actions based on their outcomes, aiming for the greatest good or benefit, whilst deontology, in contrast, bases moral rightness on adherence to universal principles and rationality, advocating for actions that conform to moral rules or codes (see, Lewis & Gilman 2012).

In high-stakes emergency response, the ethical frameworks of virtue ethics, consequentialism, and deontology provide an approach to decision-making that guide responders through the complexities of their roles. These responders are frequently confronted with situations that demand rapid judgment (Power & Alison 2018) and a strict adherence to ethical standards (Larkin & Arnold 2003), highlighting the importance of a well-rounded ethical foundation in their training and practice. However, whilst virtue ethics encourages the development of moral character, advocating for qualities such as compassion and resilience, there is little understanding on how these principles guide effective and empathetic responses to emergencies (May et al. 2023). The focus on personal virtue can enhance the responders' ability to navigate the moral dilemmas they encounter, with the aim

of fostering a holistic approach to their duties that prioritises the well-being of those they serve. Yet, we often see a focus on consequentialist and deontological reasoning (e.g., Maile et al. 2023). Consequentialism emphasises the *outcomes of actions*, guiding emergency responders to consider the broader implications of their decisions. This perspective aims for the most beneficial results for individuals and communities in crisis, highlighting the importance of evaluating the consequences of various response strategies to ensure that they align with the goal of maximising positive outcomes. However, this approach can lead to ethical dilemmas where the rights or well-being of a minority are sacrificed for the majority's benefit (Rebera and Rafalowski 2014). In emergency response, this could lead to decisions that, while maximising overall outcomes, might be viewed as unethical or unjust by affecting individuals or groups negatively.

Deontological principles, therefore, at face value appear to offer a nuanced ethical framework as it contributes an additional layer of ethical consideration, focusing on adherence to ethical codes and standards. According to Etkin et al. (2016), deontological ethics is rooted in the belief that the moral worth of actions is determined by their *nature* and the *intentions* behind them, encouraging a universal adherence to morally correct behaviours regardless of the consequences. Thus, the significance of consistency and fairness in emergency response efforts are key, ensuring that actions are guided by principles that uphold human dignity and value (Lewis & Gilman 2012; Zack 2009). These principles, inform the obligations of governments and responders to provide emergency aid and support to victims. As such, the ethical commitments are foundational to emergency response policy and legislation, reflecting the commitment to the preservation of life and the protection of individuals at all times (e.g., Jennings & Arras 2016; Larkin & Arnold 2003; Zack 2009). However, it is important to consider the challenges these principles present in practice. Deontological ethics, introduce significant challenges in situations where least-worst outcomes may be necessary for optimising emergency response effectiveness. In critical incident events, emergency responders are often faced with making time critical decisions that could have severe consequences (Shortland et al. 2020). The deontological insistence on actions being morally correct based on their nature and intentions (Etkin, Etkin et al. 2016), and the emphasis on human dignity and value (Lewis & Gilman 2012) can be counterintuitive. For instance, in a scenario where resources are limited and the situation demands prioritising assistance to those most likely to survive, a strict deontological approach might require efforts to save all, irrespective of the practical implications or likelihood of success. Zhang et al. (2014) found that the deontological principles of regulatory focus significantly influenced sub-optimal decision outcomes. Other research (e.g., Welsh et al. 2015), further support this, as a deontological focus on decision repetition in moral tasks, can result in sub-optimal outcomes. This rigid adherence to principles can, paradoxically, lead to outcomes that are less optimal from both a virtue ethical perspective, which values compassion and practicality, and a consequentialist perspective, which seeks the greatest overall good.

The primary issue, therefore, appears to arise from the conflict between deontological ethics and the real-world demands of emergency scenarios. Deontological ethics, values actions deemed morally right on their own, but this stance does not fit well with the necessity to make time critical, *least-worst* decisions in emergencies—decisions that, whilst not perfect, are the *best* under challenging circumstances. For instance, the choice to save as many lives as possible, even at the expense of not being able to assist everyone, is a practical approach favoured by consequentialist thinking. This may contradict deontological rules, which typically reject making choices based on their outcomes. However, current understanding of how deontological and consequentialist ethics interact, especially regarding their impact on decision-making, is limited. This is particularly evident in situations where hesitancy to make a decision prevents achieving optimal outcomes. Therefore, there is a need for research to assess how these ethical frameworks influence such hesitancy and the quality of decisions in time critical, high-pressured, and complex situations. As such, the current study sought to explore the effects of deontological and consequentialist ethics on decision-making inertia and the quality of decisions during critical incidents.

Given the intersection of ethical frameworks and decision-making in emergency contexts, it is important to bridge our understanding of deontological and consequentialist ethics with the cognitive mechanisms that underpin decision-making processes. These cognitive mechanisms can be broadly defined by system one and system two cognitive processes (Kahneman 2011). These processes govern our rational and experiential thinking and play key roles in how ethical considerations are weighed and acted upon in real-time decisions. The rapid, instinctual responses driven by system 1 thinking often align with the need for immediate, outcome-focused decisions in emergencies, reflecting a consequentialist approach. In contrast, the more deliberate and reasoned evaluations characteristic of system 2 thinking can be associated with deontological ethics, where decisions are made based on moral principles, regardless of the outcome. This however might also involve a more complex network; for instance, prominent morality theories have suggested the in certain moral situations deliberate choices are utilitarian whereas deontological decisions are based on automatic processes (e.g., Greene 2007).

1.4 Bayesian updating and decision inertia

Expected Utility Theory (EUT) posited that individuals make decisions by calculating the weighted utility of outcomes based on their probabilities, selecting the option with the highest expected utility. Savage (1954) extended this model with Subjective Expected Utility (SEU), allowing individuals to assign subjective probabilities to uncertain outcomes. Together, these models aimed to formalize rational choice through axiomatic consistency (i.e., assuming stable preferences, logical ordering, and context-invariant evaluation of options). However, real-world decision-making is often separated from these principles. Allais (1953) and Ellsberg (1961) revealed that people routinely violate cancellation and ambiguity-neutrality, preferring certainty or known risks over mathematically optimal outcomes. These findings suggest a gap between normative theories and actual behaviour, especially in high-stakes scenarios.

Subsequent theories addressed this by incorporating bounded rationality. Simon (1956) proposed that decision-makers operate within cognitive and informational constraints, relying on heuristics and satisficing rather than optimal calculations. Indeed, Prospect Theory (Kahneman & Tversky 1979) challenged EUT by empirically showing that decision-makers frame outcomes relative to reference points and are disproportionately sensitive to losses over equivalent gains. Its key elements (i.e., reference dependence, loss aversion, diminishing sensitivity, and probability weighting) collectively show a systematic departure from rational utility maximisation.

This becomes particularly salient in emergencies, where decisions must be made under time constraint, often with incomplete or ambiguous information (Alison et al., (Alison, et al., 2013)). Here, even boundedly rational models can fall short. The volatility and time pressure of such environments impair decision-makers' ability to adapt dynamically, even when doing so would improve outcomes. This is often referred to as *Bayesian updating* – a process of belief revision, which rely on prior beliefs with new evidence to generate updated, probabilistically informed decisions. Theoretically, it offers a decision model suited to uncertainty and change. Yet in practice, individuals often fail to update their priors, instead relying on intuitive judgments or default strategies (Kahneman & Tversky, (Tversky, et al., 1973); Zizzo et al. 2000). For instance, Alós-Ferrer et al. (2016) highlighted how a cognitive preference for consistency and convergency leads individuals to repeat decisions even in the face of contradictory information.

Thus, rather than treating Bayesian updating as a statistical tool, this study seeks to apply it as a cognitive reference point for diagnosing suboptimal decision-making. In this regard, this study advances the concept of decision inertia as a failure to adjust or abandon initial judgments (priors), even when updated environmental cues suggest they are no longer optimal.

1.5 Rationality and experiential decision making

Similar to dual-process theories in clinical decision-making, emergency response decision-making operates through two primary systems: system 1 (experiential or intuitive decision-making) and system 2 (rational or analytical decision-making) (e.g., Croskerry 2009; Croskerry & Norman 2008; Sladek et al. 2006, 2008). System 1 is characterised by rapid, instinctual reactions that rely on heuristics requiring minimal conscious deliberation (Power 2015). This model is particularly important in high-stress scenarios where immediate decisions can mean the difference between life and death, such as deciding to enter a burning building to save lives (Cohen-Hatton et al. 2015; Wilkinson et al. 2019). System two, in contrast, involves a deliberate, critical evaluation of the situation, taking into account various factors and evidence, which is essential for strategic planning and complex problem-solving, like coordinating a large-scale emergency response (e.g., to a terrorist attack; Power & Alison 2017a, b). Emergency responders, frequently balance these two decision-making systems based on the demands of the situation at hand. The dynamic and often time-critical nature of their work necessitates a fluid transition between intuitive, quick decision-making and more methodical, reasoned approaches. The use of a particular decision-making style may vary among individuals and can be influenced by factors such as training, experience, and the specific challenges posed by their role in emergency response (e.g., Shortland et al. 2020).

The Cognitive-Experiential Self-Theory (Epstein 1998) provides a further understanding and proposes that the dual-process approach to decision-making, involves rational and experiential modes of information processing. Rational decision-making relies on conscious, analytical criteria, while experiential decision-making incorporates automatic, intuitive, and emotionally driven factors. In emergency response, striking a balance between these two modalities is essential. However, a preference for the experiential mode can lead to increased decision inertia (Power & Alison 2018). When responders focus on emotional drivers, they may defer or delay decisions, or rely on cognitive heuristics (e.g., Jung et al. 2019). Yet, decision-makers who prioritise rational thinking are more likely to decrease decision inertia as they apply standard operating procedures logically and objectively, without being influenced by moral judgments or framing effects (Calabretta et al. 2016).

As such, understanding these decision-making styles is important for optimising emergency response operations and ensuring that responders are able to make the best possible decisions. Within this context it is also essential to

consider the concept of decision inertia, which highlights a conflict between instinctual decision-making (e.g., System 1) and the process of Bayesian updating. In scenarios where there is a discrepancy between these two processes, research has demonstrated an increase in sub-optimal decision outcomes (e.g., Alós-Ferrer et al. 2016). This is consistent with the dual process view that decision inertia is an automatic experiential process that conflicts with a more rational, controlled one (Alos-Ferrer et al. 2016; Jung et al. 2019). Understanding this dynamic is therefore important for enhancing decision-making processes in emergency situations, where the rapidity and correctness of decisions can critically affect outcomes.

1.6 Towards grim-storytelling: a narrative framing effect

Given the above, there is a requirement to look toward *action-based* approaches to decision-making (Ford and Ogilvie 1996). Action-based approaches prioritises proactive searching and engagement over reliance on known solutions, and irrespective of morality positioning. This perspective supports principles of Bayesian updating, and the critical distinction between simply instructing and fostering an individual's ability to critically evaluate information (Greenbank & Hepworth 2008). Current approaches for responding to high-stakes incidents heavily rely on training and instruction rooted in past experiences, simulation exercises, and policy guidelines (e.g., Alison & Crego, (Alison 2008)). However, the requirement to shift towards action-based decision-making strategies is evident, as these strategies emphasise proactive exploration and engagement rather than dependence on established solutions (Ford & Ogilvie, (Ford, and Ogilvie, 1965)). For example, Watts et al. (2021) stressed the importance of moving beyond directive methods, such as simulation training, and encouraged an educational approach that equipped individuals with the knowledge, skills, and attitudes necessary to identify and overcome future challenges independently. This, therefore, positioned responders to high-stakes events as the primary agents of their own decision-making processes. This highlighted the value of empowering individuals to think critically and act autonomously; principles that are essential for encouraging innovation and adaptive problem-solving in complex scenarios.

Early studies on decision-making have shown that understanding a situation fully is not always possible, however, it nevertheless requires the prioritisation of certain elements over others (see, Klein et al. 2011). Moreover, many decision-making errors arise from incorrect or outdated interpretations of a situation (Orasanu et al., (Orasanu 1998)). Decision inertia is subsequently driven by two problematic thought processes. The first involves an endless pursuit for information when it becomes clear that no more information can be obtained. This not only reflects a failure to achieve situational awareness but also an unawareness of incident itself. It is important to note, that this aspect of Bayesian updating has been generally ignored in research (see, Alison et al. 2022). The second issue arises when individuals become trapped in a loop of forecasting various outcomes, by excessively analysing potential outcomes. While predicting the consequences of decisions is typically seen as reasonable (Tversky & Kahnman 1988), becoming fixated in the perpetual contemplation prevents any real action, resulting in the individual ineffectively responding to and managing a situation. In such cases, the act of thinking obstructs the imperative to act, reducing the individual's role to that of an observer. This then becomes an issue not of decision-making per se, but rather sense-making and a *failure to imagine* the possible outcomes (Alison et al. 2022; Shortland et al. 2020).

The concept of a *failure to imagine*, particularly in the context of critical incidents, has been emphasised by historical accounts, such as the U.S. investigation into the 9/11 attacks. The 9/11 Commission highlighted a lack of *imaginative foresight* as a critical barrier to the response efforts (9/11 Commission 2004). It was suggested that institutionalising imaginative exercises as a preventive measure against decision failures (e.g., decision inertia). Despite a surge in critical incidents events (e.g., terrorism-related events post-9/11; May et al. 2023), the emphasis on the role of imagination and narratives to countering decision failures remains minimal (Schuurman 2018; Wirtz & Rohrbeck 2017).

The narrative approach, therefore, utilises principles of *grim story telling narratives* (see, Alison et al. 2022) – an approach that applies pessimistic perspectives (e.g., frames a least-worst outcome) and scenario-based learning to immerse learners in critical, high-stakes environments. A grim narrative method, thus positions participants directly in intense situations requiring immediate, decisions. Yet, there is little empirical evidence to show whether such narratives can counter decision inertia effects, in a deontological principled environment. As such, the current study aimed to enhance decision-making outcomes (i.e., toward optimal outcomes) by providing grim narratives, giving individuals a partial situational awareness, resisting the urge for excessive information, and encouraging individuals to make decisive choices among suboptimal alternatives.

1.7 Integrating an extended reality environment

Virtual reality (VR) has emerged as an innovative tool in research, offering capabilities to immerse participants in digitally constructed environments. This technology has enabled the simulation of diverse scenarios with high levels of experimental control (Blascovich et al. 2002; Mania & Chalmers 2001; van Gelder et al. 2017). For instance, researchers

can simulate crime scenes for individuals to witness and then assess their responses as if they were actual witnesses (Acampora et al. 2023). The dynamic nature of VR, therefore, allows for the observation of participant behaviour in real-time, and explore previously inaccessible phenomena (van Gelder et al. 2014). The utilisation of VR has also seen significant advancements in the application of simulated environments. Current technologies enable the collection of detailed data within VR settings (e.g., Ratcliffe et al. 2021). These improvements in both software and hardware have enhanced the immersive quality of VR experiences (Slater & Sanchez-Vives 2016) and the accessibility of VR (Ratcliffe et al. 2021). VR enables the individual feeling of presences (i.e., being there), which makes choices more related to real life decision making and enables to evoke stronger emotional responses (Slater et al. 2009). We used VR to assess moral decision making in action in VR in a previous study and found that participant exhibited predominantly utilitarian actions whilst stimulation deontological choices, thus subsequently regretting their impulsive emotive choice in VR (Francis et al. 2016).

This also includes the use of augmented reality (AR), which layers digital information over the real world (Liao et al. 2020). These developments show the transition towards more inclusive immersive experiences, collectively referred to as extended reality (XR). As such, using XR scenarios enables a shift towards a more experimental methodology, tackling a fundamental obstacle in research of complex scenarios (e.g., Dezember et al. 2021).

1.8 The present study

Despite the recognition of decision inertia, there exists a significant research gap concerning the cognitive processes underpinning this phenomenon, suggesting a need for empirical studies to examine the factors contributing to decision inertia. This study, therefore, undertook an empirical examination of the cognitive factors that might generate decision inertia effects, introducing a practical framework aimed at mitigating such inertia through strategic interventions. First, the present exploratory research sought to examine the phenomenon of decision inertia though the lens of socio-cognitive mechanisms and its implications on decision inertia and outcomes within high-pressure situations. It took a twofold approach: firstly, examining the characteristics of Bayesian updating, particularly focusing on the phenomena of convergence or divergence, and their mediated relationship with decision inertia on the decision outcomes. Secondly, the study examined the nuances of decision inertia itself, exploring the impact of decision modality—specifically, rational versus experiential decision-making—and the influence of narrative framing, herein operationalised through grim storytelling, on decision-making processes. In addressing these challenges, this study introduced 360-degree XR as a methodological innovation to examine decision inertia in high-stakes scenarios. The immersive nature of XR, offered a novel solution to simulate complex decision-making environments with high fidelity and realism (May et al. 2024). Not only does this approach facilitate an understanding of the cognitive and social underpinnings of decision inertia but also allows for the exploration of strategic interventions (e.g., narrative framing) to combat inertia, thereby enhancing decision-making efficacy in critical situations. Three research questions were formulated to help direct the research:

1) How do convergence and divergence in Bayesian updating influence decision inertia and outcomes in high-pressure decision-making scenarios?
2) What is the role of decision modality (rational vs. experiential decision-making) in influencing decision inertia?
3) How does narrative framing through grim storytelling affect decision-making processes and decision inertia?

2 Methods

2.1 Participants

Participants were recruited using an opportunistic sampling method, using sona-systems – where each participants received 2-credits—and direct online recruitment (e.g., social media advertisement). One hundred and fifty participants were recruited, however, 31 were removed from all subsequent analysis having completed less than 50% of the overall study. 119 participants (12 male; 104 female; 3 other; $M_{age} = 22.79$; $SD_{age} = 9.83$) submitted their full response, and were suitable for analysis. Of all participants, six of them did state they had experience with emergency response decision-making.

2.2 Design

This study used an exploratory mixed design that involved (i) a survey on morality orientation to assess differences in deontological versus consequentialist perspectives on decision inertia; (ii) a Bayesian updating task, where all participants were asked to complete a virtual reality task; (iii) a time-delay task, where participants were randomly assigned to either a game of 'snake' ($N = 52$), or a control group ($N = 59$), with no time delay to assess the effects of time on Bayesian updating; (iv) a decision modality survey, where all participant were asked to complete the The Rational-Experiential Inventory (REI-40), to measure rational versus experiential thinking; and (v) an 'action-based' narrative

framing manipulation, where participants were randomly assigned to either a 'grim-story' ($N=52$) narrative (i.e., presenting participants with details on least-worst outcomes) or deontological ($N=53$) narrative (i.e., presenting participants with deontological instructions to save lives). See Table 1 for the vignettes used.

2.3 Materials

2.3.1 Semantically adapted rationale-experiential inventory (REI-40)

The REI-40 (Pacini & Epstein 1999) was semantically adapted to better align with the context of emergency decision-making and moral reasoning. This consisted of 40 questions aimed at assessing an individual's predisposition towards System one and System two decision-making: System one (i.e., intuitive experientiality) and System two (i.e., cognitive rationality) preferences. This tool is divided into four categories, each represented by 10 questions and utilises a 5-point Likert scale for responses, which range from 'definitely false' (1) to 'definitely true' (5). Participants are prompted to evaluate their own skills or pleasure in engaging with rational or intuitive decision-making processes:

1. *Rational ability* refers to participants self-assessed capacity for logical and analytical thought (for example, "*I possess a logical mindset.*")
2. *Rational engagement* involves participants self-reported dependency on and pleasure from engaging in logical and analytical thought (for instance, "*I find intellectual challenges rewarding.*")
3. *Experiential ability* refers to participants self-evaluated proficiency with intuitive insights and emotions (for example, "*I trust my instincts.*")
4. *Experiential engagement* refers to participants self-reported reliance on and pleasure from employing emotions and intuitions (for example, "*I often let my heart lead my decisions.*")

Scores for rational modality were calculated by summing the answers from both the rational ability and rational

Table 1 Deontological Versus the Grim-Storytelling Narrative Used (the manipulation is shown in bold)

	Study Narrative
Deontological Narrative	*You are a senior decision-maker, responding to a terrorist incident. Remember, as a senior decision maker,* ***your job is to save as many people as possible.*** *When you arrive on scene you are made aware of an active suicide bomber, holding a triggered suicide vest. The terrorist has stated that he will detonate the suicide vest if there are any attempts to rescue the four hostages. The intelligence suggests that an attempt to rescue the hostages may result in the suicide vest exploding, killing everyone. You also notice a seriously injured female lying on the floor. You are confident that you are able to save her; however, as your resources are limited you may not have the time to save the hostages as well*
Grim-Storytelling Narrative	*You are a senior decision-maker, responding to a terrorist incident. Remember, as a senior decision maker, your job is to save as many people as possible.* ***But, sometimes it is not always possible to save everyone. It is okay that you may only be able to save a few rather than risk everyone.*** *When you arrive on scene you are made aware of an active suicide bomber, holding a triggered suicide vest. The terrorist has stated that he will detonate the suicide vest if there are any attempts to rescue the four hostages. The intelligence suggests that an attempt to rescue the hostages may result in the suicide vest exploding, killing everyone. You also notice a seriously injured female lying on the floor. You are confident that you are able to save her; however, as your resources are limited you may not have the time to save the hostages as well*

engagement sections, while scores for experiential thought were calculated from the sum of the responses in the experiential ability and experiential engagement. Note the REI-40 has been validated with students (Epstein et al. 1996) and is internally consistent and highly reliable, with the Cronbach alpha ranging from 0.74 to 0.91 (McLaughlin et al. 2014).

2.3.2 Pre-immersion morality task

Ethical decision-making processes was first introduced as a philosophical thought experiment by Foot (1967). This dilemma, known as the trolley problem (Foot 1967), scrutinised the moral dilemmas faced when an individual must choose between sacrificing a single individual to save a larger group, or failing to act from an intervention, thereby allowing a greater number of individuals to die. This scenario, involving the decision of directing a trolley's course, serves as a classic exploration of consequentialist ethics versus deontological principles. Subsequent adaptations of this dilemma, such as those by Faulhaber et al. (2019), have extended its application to contemporary issues in technology, particularly in the programming of ethical decision-making frameworks for autonomous vehicles. Moreover, empirical investigations, like those conducted by Francis et al. (2016) and Patil et al. (2014), have revealed that individuals' behaviours in simulated environments exhibit a more utilitarian approach than their self-reported ethical stances might suggest. As such, an adapted version of the Trolley Problem was developed, specifically oriented towards critical incident scenarios and decision-making processes in emergency responses. The primary aim of this adaptation was to predispose participants towards a deontological ethical stance emphasising the principle of 'preservation of life'. This methodological choice was intended to foster Bayesian updating effects, thereby encouraging participants to revise their beliefs in light of new evidence, particularly in the context of moral and ethical decision-making during emergencies.

2.3.3 Extended reality immersion task

A simulated critical incident scenario using a 360-degree camera and 3D vista, were used to create an extended reality environment (see Fig. 1). This follows on from the XR proof of concept design to enable the empirical assessment of decision inertia (see May et al. 2024). This simulation depicted a faux terrorist suicide attack with four individuals acting as hostages and a mannequin portraying a wounded person. To construct this scene, a series of 360-degree photographs were taken from various angles and subsequently merged with image processing software (i.e., 3D Vista). This enabled a high-fidelity portrayal of the event, offering participants an immersive experience of the setting with the capability to move between nodes. To further augment the sense of immersion, sound effects (e.g., police sirens) were integrated into the virtual file. These sound effects were used to create a more authentic experience, increasing the fidelity of the environment for the participants.

2.3.4 Post-immersion decision-inertia questionnaire

Participants were asked to complete to a questionnaire that assessed their characteristics related to decision inertia. A set of 20 items, adapted from Power et al. (2018), which measured aspects of decision inertia (e.g., "I would defer my decision to someone else") was presented. The scale was anchored on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

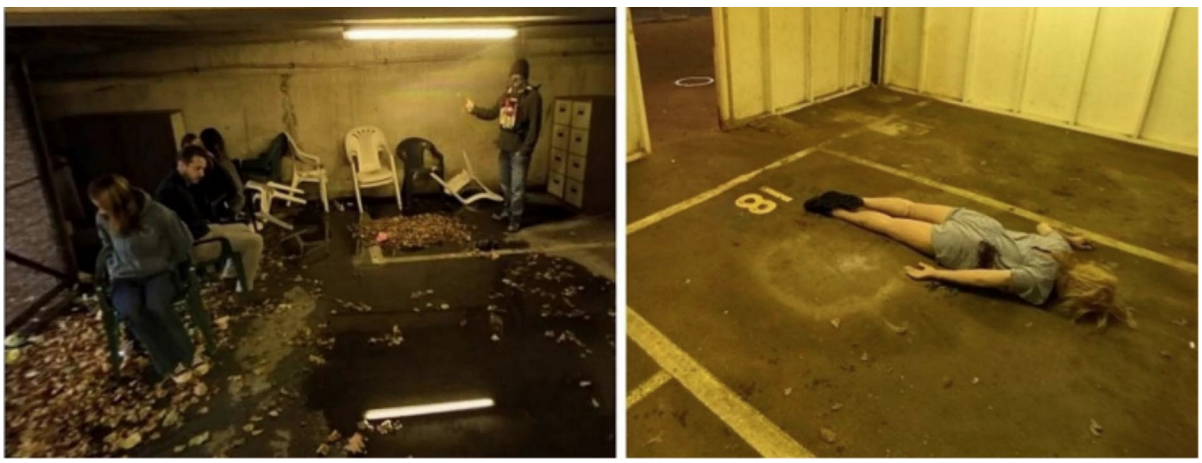

Fig. 1 A screenshot of the immersive scenario (see May et al. 2024)

2.4 Procedure

To address the exploratory research questions, an online experimental study was conducted (see Fig. 2). Ethical approval was obtained from the University of Portsmouth; ethical reference: *FHSS 2023–054*. All participants were asked to provide their full consent before participating in the study. Participants that did not provide their full consent, were navigated to the online debrief. Before each task, participants were provided instructions on how to complete the task. To start participants completed a decision modality questionnaire, to measure their thinking processes (i.e., rational versus experiential decision-makers). Next, all participants were asked to complete a morality task, based on an adapted version of the Trolley problem (Foot 1967), and with a focus on emergency response scenarios (May et al. 2024). Participants were then randomly allocated to one of two conditions: a distraction task, where participants were asked to complete a game of Snake, or a control group with no time delay. Participants were then randomly allocated into one of two conditions: the Grim-storytelling narrative, or the control group. All participants where then asked to engage with the extended reality task, followed by a selection of 5 decision outcomes: Save the injured individual, save the hostages, defer the decision, choice not to make a decision, or I don't know. Following this, all participants completed a post-experiment questionnaire to measure self-reported decision-inertia (Fig. 2).

2.5 Analysis

Analysis started with an Exploratory Factor Analysis (EFA), to identify the structure of the Decision Inertia Score (DIS). This initial phase was important for determining the inter-related correlations within the DIS, and for a clearer understanding of decision-making processes. The EFA also yielded factor loadings that enabled semantic categorisation within the scale, tailoring the DIS to capture the cognitive dimensions relevant to this study.

Once these categorises were established, a refined Decision Inertia Score was computed. This computation integrated a weighted normalisation process, anchoring the new scale within empirically substantiated boundaries. The weights assigned to each semantic category were resultant from empirical evidence. After score computation, the strength and direction of relationships between the DIS and predictive independent variables were computed: congruency, divergency for grim and non-grim narratives, and moral orientation.

To evaluate the predictive validity of the DIS in forecasting decision outcomes, Receiver Operating Characteristic (ROC) analysis was used. This allowed for examining how well the DIS differentiated between outcomes characterised by congruency or divergency in narrative context. The ROC curves quantitatively assessed the discriminative power of the DIS, thus validating its practical utility in predicting decision convergence. Following this, Eta coefficients were used to identify the associations between decision outcomes and the constructs of decision inertia. Eta squared, in particular, offered a quantification of the effect size, providing an understanding of the magnitude of these associations. The identification of time delay as a potential confounding variable was included in our analysis. A correlation for time delay was undertaken with the semantically categorised constructs of decision inertia. Further examination was directed toward the influences of rationality and experientiality as independent variables on decision inertia scores. Finally, to isolate the influence of narrative framing, a chi-squared analysis was run. This allowed an evaluation of the association of narrative framing with optimal versus suboptimal decision-making.

3 Results

3.1 Principle component analysis

First Exploratory Factor Analysis (EFA) was performed to identify inter-item correlations leading to the extraction of constructs related to decision inertia from the decision inertia questionnaire. From a first EFA outcome, four items (Q9, Q10, Q11 and Q13) with low inter-item correlation

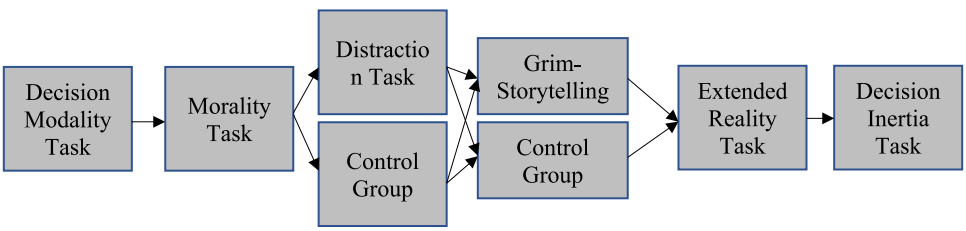

Fig. 2 Experimental Procedure (an online, pre-experiment decision modality questionnaire, followed by a morality questionnaire based on the adapted Trolley Problem followed by a distraction task and narrative framing, and then the extended reality task, and post-experiment questionnaire on decision inertia)

($r < 0.3$) or individual factor loading (i.e., < 0.3) were removed from the factor analysis. The final EFA performed on 17 items used Principal Component Analysis to extract factors with a criterion of eigen value, $e > 1$. The overall Kaiser–Meyer–Olkin measure of sampling (KMO = 0.746), and the significance of the Bartlett test of sphericity ($X^2(120) = 781.20$, $p < 0.001$), together provided the necessary checks for data analysis suitability. Five factors with an eigen value ($e > 1$) were extracted. This number was confirmed by the location of the inflexion point on the screeplot. However, a Varimax rotation provided a clearer factor identification, with respectively 14.64, 13.71, 11.29, 10.66, and 9.09% variance accounted for, with a cumulative variance of 59.39%. Note, as the explainable variance for factor five accounted for less than 10% of the cumulative variance, a forced factor approach was taken, to extract four total factors. The Varimax rotation provided four factor identifications, with respective loadings of 16.06, 14.99, 14.28 and 11.77%, with a cumulative variance of 57.11%.

While concerns may arise regarding the adequacy of a sample size ($N = 119$) in relation to the number of variables, MacCallum et al. (1999) argue that when communalities are moderate to high and each factor is defined by at least three variables with meaningful loadings (i.e., conditions that were met in this analysis) samples as low as 100–120 can yield robust and replicable factor solutions. In this study, each of the four retained factors was defined by at least three items with loadings typically exceeding 0.40, and the structure was judged to be overdetermined and interpretable. These conditions, combined with the satisfactory KMO and significant Bartlett's test, support the methodological adequacy of the sample for exploratory factor analysis.

Thus, based on items semantic similarity, 4 constructs corresponding to the 4 factors were identified. They respectively correspond to '*Decision Paralysis*'; '*Fear of Blame and Regret*'; '*Decision Deferral*'; and '*Applying Experience and Training*'. Item grouping within their constructs are presented in Table 2.

Following the extraction of four latent factors, bivariate intercorrelations between the mean score of each factor to assess the degree of conceptual overlap among factors was undertaken. Decision Paralysis was significantly positively correlated with both Fear of Blame and Regret, $r\ (93) = 0.48$, $p < 0.001$, and Decision Deferral, $r\ (92) = 0.49$, $p < 0.001$. A smaller non-significant associated was observed between Decision Paralysis and Experience and Training ($p > 0.05$). Similarly, Fear of Blame and Regret was positively associated with Decision Deferral, $r\ (96) = 0.35$, $p < 0.001$) but not with Experience and Training ($p > 0.05$). Lastly, Decision Deferral was not significantly associated with Experience and Training ($p > 0.05$).

Table 2 Item, Construct Identification and Significance of Pearson Coefficient of Correlations between Item, Construct and Decision Outcome

	Item	Factor Loading	Construct	r_s	Cronbach Alpha
Q15	I felt that I missed an opportunity to make a better decision	0.705	Decision Paralysis	0.157*	0.75
Q16	There were too many options to pick between	0.669	$r_s = 0.20$, $p = 0.013$		
Q12	After I made the decision, I was eager to consider a different option	0.528		ns	
Q14	I wanted to wait and see what happened	0.384		ns	
Q7	I needed more time to consider my options	0.619		ns	
Q18	I was uncertain about my potential options	0.548		ns	
Q19	I would be worried about being blamed for the wrong decision	0.490	Fear of Blame and Regret	ns	0.87
Q20	I would be worried that I would regret my decision in the future	0.448	$r_s = -0.04$, $p = 0.644$	ns	
Q21	I would be worried that I would be held accountable for my decision	0.433		ns	
Q5	I would want to defer my decision to a more senior colleague	0.524	Decision Deferral	ns	0.60
Q6	I would want to defer my decision to someone else	0.381	$r_s = 0.18$, $p = .024$	ns	
Q4	I needed more information before I could make a decision	0.356		ns	
Q8	I relied on my training to help me make a decision	0.447	Experience and Training	ns	0.58
Q17	I was confident in the actions I took	0.535	$r_s = -0.08$, $p = 0.318$	ns	
Q1	There was an optimal decision	0.637		ns	
Q3	I relied on my previous experiences to help me make a decision	0.782		ns	
Q2	I made a decision on how best to respond to the scene	0.343		0.175*	

Correlations were calculated for each construct: Decision Paralysis, r

*$p < .05$

3.2 Exploratory analysis: decision outcome and bayesian updating

Next, the objective of the exploratory analysis was to examine the underlying relationships between decision inertia and outcomes, as influenced by individual differences in morality orientation (e.g., deontological versus consequentialist), and the Bayesian outcomes of decisions characterised as either congruent or divergent decisions. This phase of the analysis allowed for an understanding of the distribution of the key variables of interest: congruency vs divergency (i.e., Bayesian updating), and morality orientation, alongside weighted responses to the key decision inertia constructs identified in the EFA.

To achieve this, weighted scores based on the arbitrary interpretation of where decision outcomes fell on the deontological (e.g., principle-based) to consequentialist (e.g., outcome-based) spectrum, from 0 to 10, where 0 was purely deontological, 10 was purely consequentialist, and 5 represented a neutral position, were applied. See Table 3, for the assigned scores and explanation of decision outcomes and their corresponding rationale. Next, a normalisation technique was used to adjust the values measured to a notional common scale, ranging from 0 to 1.

$$NormalisedScore = \frac{DecisionOutcome - MinimumScore}{MaximumScore - MinimumScore}$$

Then theoretically assigned weights $(\alpha, \beta, \gamma, \delta)$ – see below for further details—for Decision Paralysis (DP); 'Fear of Blame and Regret (FBR)'; 'Decision Deferral (DD); and Applying Experience and Training (AET), were applied. Each weight was applied to participant responses to quantify the influence of each orientation on participants decision outcome. The calculation for each participant's weighted decision-inertia score (WDIS) were as followed:

$$WDIS = NormalisedScore + \alpha(DP) + \beta(FBR) + \gamma(DD) + \delta(AET)$$

Note, this represented a composite measure, integrating four latent constructs derived from the exploratory factor analysis (i.e., Decision Paralysis, Fear of Blame and Regret, Decision Deferral, and Application of Experience and Training). This index was used to quantify susceptibility to decision inertia and serve as a predictive variable in subsequent regression and classification analyses. Its structure allowed us to examine how specific psychological barriers—weighted by theoretical salience—correlated with decision outcomes (e.g., convergence, divergence, and optimality).

For instance, while many prior measures treat decision inertia as a unidimensional phenomenon (e.g., delay, inaction, or avoidance), recent literature highlights the necessity of capturing its dynamic structure (May et al. 2023, 2024), which includes affective, cognitive, and behavioural contributors (Alós-Ferrer et al. 2016; Jung et al. 2019; Power & Alison 2018). The WDIS advances this by assigning

Table 3 Exemplar latent constructs and theoretical weights for the WDIS

Latent construct	WDIS Weight	Description
Decision paralysis	0.5	Reflects *cognitive overload and indecisiveness* that occurs when individuals are faced with complex or morally ambiguous choices. Research shows that paralysis is a core mechanism of decision inertia, arising when individuals seek perfect information before acting (e.g., Klein et al. 2011; Slovic 2007). This has been empirically linked to reduced Bayesian updating and action latency (Alison et al. 2022; May et al. 2024)
Fear of Blame and Regret	0.5	Attempts to capture *affective inhibition*, where anticipated negative consequences (e.g., personal accountability, regret, social disapproval) distort the decision-making process (Kahneman & Tversky 1984). The literature on *anticipated regret* suggests that fear of error, rather than uncertainty per se, is often the most paralysing influence on action (e.g.,Zeelenberg 1999)
Decision Deferral	0.2	Reflects *avoidance-based behaviour (i.e.,* passing responsibility to others or postponing commitment). It is distinct from paralysis in that it involves a conscious transfer of agency. While deferral may be adaptive in certain team-based contexts (e.g., escalation protocols), excessive reliance is associated with reduced accountability and diminished autonomy (Anderson 2003; Power & Alison 2017b). In this context, its low weight is associated as a more peripheral behavioural strategy rather than a central cognitive block
Application of Experience and Training	0.3	Reflects the *resilience mechanisms* that may counteract inertia, drawing upon prior knowledge and procedural schemas to reduce ambiguity (Charness & Levin 2005). In naturalistic decision-making models (e.g., Recognition-Primed Decision-Making; Klein, 1993), experience acts as a buffer against the need for exhaustive information search. However, while experience can enable rapid action, it may also reinforce default or status quo biases, especially in scenarios where past knowledge is poorly generalisable (Garland & Newport 1991). The moderate weight here would reflect its dual potential to both mitigate and sustain inertia

Weights were conceptually justified and not derived from post hoc statistical modelling, which preserved the exploratory nature of this study and avoided overfitting predictive models to sample-specific patterns

theoretically derived weights to each component, based on their theoretically relative influence on decision-making processes under uncertainty (see Table X for an exemplar).

Next, a correlation analyses was conducted to preliminarily assess the strength and direction of relationships between WDIS, congruency and divergency, and morality orientation. WDIS were significantly correlated to Bayesian updating (i.e., congruent vs divergent) outcomes for both non-grim narratives, $r(47) = -0.19$, $p = 0.021$, and grim narratives, $r(42) = -0.49$, $p < 0.001$. There were no significant correlations between WDIS and morality orientation.

3.3 Exploratory multi-linear regression: predicting decision inertia

In the decision-making model, specific weights were assigned to reflect the differential impact of various psychological and experiential factors on decision outcomes. This model assigned a weight of 0.5 to both decision paralysis and fear of being blamed, a weight of 0.2 to decision deferral, and a weight of 0.3 to the application of experience and training. These weights were not arbitrarily determined but were assigned based on the consideration of empirical research and theoretical frameworks relevant to decision-making under pressure.Specifically, the assignment of equal weights (0.5) to decision paralysis and fear of being blamed was underpinned by research highlighting the impact these factors have on decision-making processes. Decision paralysis, and the fear of being blamed, are recognised as critical barriers to effective decision-making in high-stakes situations (Alós-Ferrer et al. 2016, 2017). This rationale aligns with the findings of Kahneman and Tversky ((Kahneman, 1971), (Kahneman, and Tversky, 1973)), who illustrated how individuals often deviate from rational, Bayesian behaviour, instead relying on heuristic evaluations and the aversion to negative judgments or repercussions. Conversely, the lower weight assigned to decision deferral (0.2) acknowledged its influence as a temporary avoidance strategy rather than a determinative factor in the decision outcome. This reflected the understanding that while deferral plays a role in decision-making, particularly in contexts of uncertainty, its impact is comparatively less direct than the immediate cognitive pressures exerted by fear and paralysis on decision-making efficacy. Furthermore, the weight of 0.3 attributed to the application of experience and training recognised the vital, albeit moderated, role of these factors in informing decisions. This weighting suggested an acknowledgment of the contributions of experience and training to enhancing a decision-maker's competence and confidence (Charness & Levin 2005). However, it also reflected an understanding that the benefits of experience and training are mediated by the overarching psychological dynamics of decision-making, particularly in novel or rapidly evolving situations that may not directly correlate with previous experiences or training protocols.

Based on this, we ran a regression analysis using congruency and divergence, and morality scores as predictor variables and WDIS as the outcome variable. When decision paralysis ($\alpha = 0.5$) and fear of being blamed ($\beta = 0.5$) were considered equally important, and decision deferral ($\gamma = 0.2$) and application of experience and training ($\delta = 0.3$) were considered as inferior constructs in decision outcome, the regression model explained 10.8% of the variance, $F(3,110) = 4.30$, $p = 0.007$, adjusted $R^2 = 0.08$. The only significant predictor in the model was the grim-narrative presentation ($\beta = -0.29, p = 0.002$). Additional models were run (see Table 4), to ascertain the effects of each construct identified in the EFA. Interestingly, when application of experience and training was considered a dominant factor in the regression model ($\delta = 0.9$), this accounted for the highest fit within our analysis, explaining 18.9% of the variance, $F(3,110) = 8.33$, $p < 0.001$, adjusted $R^2 = 0.17$. Grim narrative presentations negatively and significantly predicted WDIS ($\beta = -0.39, p < 0.001$). The only model not to yield a significant association was Model 4 ($p > 0.05$). See Table 5 for a full breakdown of the analysis.

3.4 Receiver operating characteristic (ROC): Predicting decision outcome

Next analysis sought to determine the predictive validity of the decision inertia scores regarding the convergence of decision outcomes. This was conducted through the computation of the Area Under the Curve (AUC) for each predictor,

Table 4 An overview of the assigned scoring system used to normalise the decision outcome scale

Decision outcome	Assigned score	Rationale
Save a single person	5	This assumed no additional information on the principle behind the choice
Save 5 hostages	10	This was a consequentialist action, aiming for the greater good
Defer decision	2.5	Leaning towards deontological, as it avoided making a utilitarian sacrifice
Don't make a decision	2.5	This indicated avoidance and neutrality
I don't know	2.5	This indicated avoidance and neutrality

[a]Assigned scores are arbitrary 'fuzzy' functions of ethical values and may not reflect the actual ethical position of participants

Table 5 A multiple regression predicting WDIS, from 3 Predictor Variables: Grim-narrative Congruency, Non-grim Narrative Congruency, and Moral orientation

	Decision inertia									
	WDIS-1		WDIS-2		WDIS-3		WDIS-4		WDIS-5	
Variable	*B*	*β*	*B*	*β*	*B*	*β*	*B*	*β*	*B*	*β*
Constant	6.70		6.25		6.11		5.80		5.50	
Grim Narrative Convergency	−0.69*	−0.30	−0.58**	−0.28	−0.69**	−0.26	−0.39*	−0.19	−0.71***	−0.39
Non-Grim Narrative Convergency	−0.33	−0.13	−0.51*	−0.22	−0.16	−0.05	−0.43	0.18	−0.31	−0.16
Morality Orientation	0.43	0.07	0.56	0.11	0.22	0.03	0.05	0.01	0.59	0.13
ΔR^2	0.11		0.14		0.07		0.06		0.19	
ΔF	4.30*		5.74***		2.71*		2.60		8.33***	

The equations used, with weightings, to calculate each regression model were as followed:

WDIS-1: Adjusted_outcome + 0.5*(Decision_Paralysis) + 0.5*(Fear_Blame_Regret) + 0.2*(Decision_Deferral) + 0.3*(Experience_Training)

WDIS-2: Adjusted_outcome + 0.9*(Decision_Paralysis) + 0.1*(Fear_Blame_Regret) + 0.1*(Decision_Deferral) + 0.1*(Experience_Training)

WDIS-3: Adjusted_outcome + 0.1*(Decision_Paralysis) + 0.9*(Fear_Blame_Regret) + 0.1*(Decision_Deferral) + 0.1*(Experience_Training)

WDIS-4: Adjusted_outcome + 0.1*(Decision_Paralysis) + 0.1*(Fear_Blame_Regret) + 0.9*(Decision_Deferral) + 0.1*(Experience_Training)

WDIS-5: Adjusted_outcome + 0.1*(Decision_Paralysis) + 0.1*(Fear_Blame_Regret) + 0.1*(Decision_Deferral) + 0.9*(Experience_Training)

*$p < 0.05$

**$p < .01$

***$p < 0.001$

followed by a comparative evaluation of their respective results. Based on the framework of signal detection theory (Bowers and Zhou 2021; Swets 1988, 2014), each predictor was represented on a Receiver Operating Characteristic (ROC) plot across two dimensions: '1—specificity' on the x-axis and 'sensitivity' on the y-axis. In this plot, a 45-degree reference line determined the threshold of chance-level prediction. In contrast, predictors that curve towards the coordinate (0,1) in the upper left corner signified an asymptotic approach to perfect prediction, as this point characterised a condition where false positives were non-existent, and only true positives were detected. The AUC metric, representing the integrated area beneath the ROC curve for each predictor, served as a quantitative measure of predictive accuracy, ranging from 0.5, indicative of a guess by chance, to 1.0. In this context, the higher the AUC value, the greater the predictor's accuracy. The main point of this phase was to evaluate whether decision inertia scores were indeed indicative of an individual's tendency to align with a optimal decision outcome, essentially assessing the scores' ability to forecast decision convergence effectively. See Table 5 for results.

3.5 Decision optimisation

Decision outcomes were next assessed to see whether participants selected optimal or sub-optimal outcomes. Sub-optimal outcomes were measures in 4 ways: selecting to save the hostages, deferring their decision to someone else, not making a decision, or selecting 'I don't know'. 42.4% ($N = 43$) selected the optimal outcome (i.e., saving the individual victim), compared to 57.8% ($N = 58$) who select a sub-optimal outcome. Eta was used to assess the associations between decision outcomes, and decision inertia constructs. Analysis revealed small to large effects: decision paralysis, $\eta^2 = 0.15$; fear of being blamed, $\eta^2 = 0.05$; decision deferral, $\eta^2 = 0.19$; and, application of experience and training, $\eta^2 = 0.07$ (Fig. 3).

3.6 Time delay

To investigate the effects of time delay, all participants were randomly assigned to one of two conditions: a time-delay task ($M_{seconds} = 313.06$, $SD_{seconds} = 299.42$), and a control condition (note, participants in the control group, were navigated to a separate instructional page, where time spent on this page was captured; $M_{seconds} = 5.6$, $SD_{seconds} = 13.48$ s. A Pearsons correlation revealed that time was significantly correlated to *application of experience and training*, $r(46) = -0.37$, $p = 0.013$. All other constructs were non-significant ($p > 0.05$).

3.7 Rational versus experiential decision modality

To assess whether system 1 (experiential) and system 2 (rational) decision modality had any association with decision outcome and decision inertia scores, participants

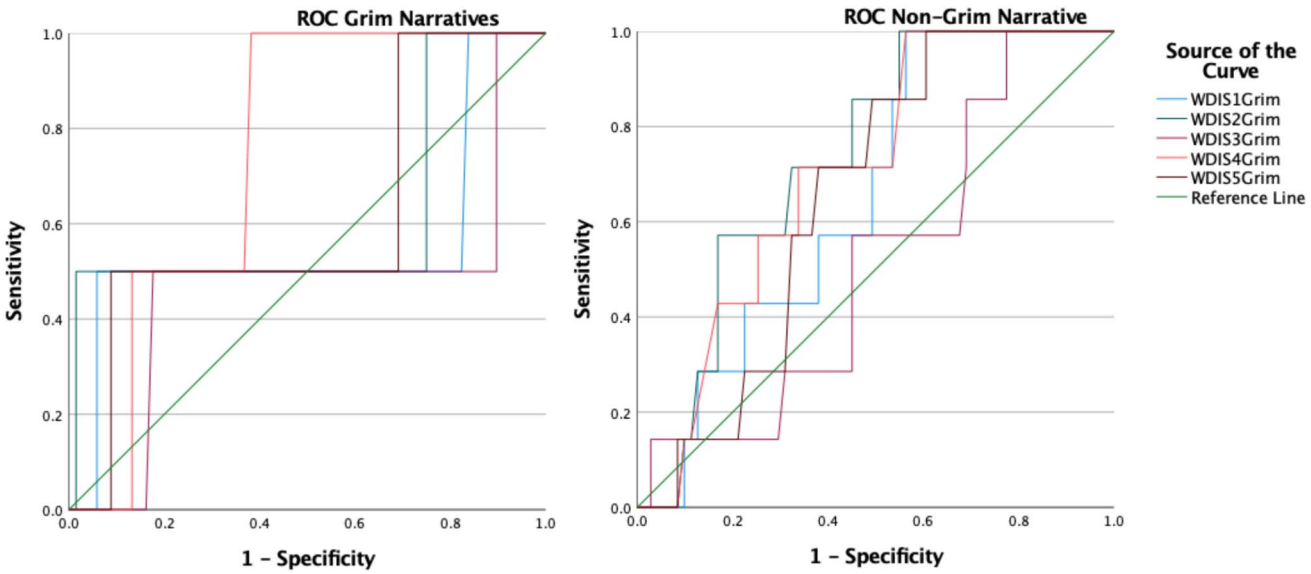

Fig. 3 ROC for Non-Grim Narratives and Grim Narratives

were tasked with completing a pre-experimental decision modality questionnaire. Participants were then scored on four levels: rationale ability (M = 3.41, SD = 0.48), rational engagement ($M = 3.08$, $SD = 0.51$), experiential ability ($M = 3.19$, $SD = 0.44$), and experiential engagement ($M = 3.46$, $SD = 0.38$). To assess whether decision modality predicted decision inertia scores, multiple regression analyses were undertaken. First, experiential decision modalities (ability and engagement) were examined to assess whether they could predict each WDIS outcome. WDIS-5 (*Application of experience and training)* was the only significant model, explaining 6.4% of the variance, $F(2, 118) = 3.99$, $p = 021$, adjusted $R^2 = 0.06$. Experiential ability was the only positive and significant predictor ($\beta = 0.29$, $p = 0.01$). Rational decision modalities (ability and engagement) were all non-significant ($p > 0.05$). All other models (WDIS-1 to 4) were non-significant ($p > 0.05$).

3.8 Narrative framing

To assess whether narrative framing had an effect on decision outcomes and WDIS, it was tested whether the narrative frames presented to the participants were associated with decision outcomes (sub-optimal versus optimal outcomes). A chi-squared analysis revealed a significant association $X^2(1) = 13.69$, $p < 0.001$, $V = 0.37$, with non-grim-storytelling narratives accounting for 39 (75%) of sub-optimal decision outcomes, compared to those presented with grim-storytelling narratives ($N = 20$, 40%).

4 Discussion

This exploratory study sought to identify factors related to decision inertia and sub-optimal decision outcome, focusing specifically on morality orientation, decision modality, and narrative framing effects. First, the principal component analysis a four-factor solution of decision inertia: *Decision Paralysis*, *Fear of Blame and Regret*, *Decision Deferral*, and *Experience and Training*. This latent structure reflected the nuance of decision inertia as more than a singular hesitation phenomenon; instead, it suggested a set of interrelated but differentiable psychological processes. For instance, *Decision Paralysis* and *Fear of Blame and Regret* appeared to be affectively driven components, aligned with dual-process models of decision-making (Kahneman 2011), wherein emotional interference (System 1) can inhibit rational, goal-directed reasoning (System 2), particularly under moral strain or perceived social accountability. These affect-laden elements may also reflect what Klein ((Klein 1998)) argued as *inertia* resulting from an overload of competing goals or uncertainty, which disrupts intuitive pattern recognition and inhibits decisive action. *Decision Deferral*, meanwhile, may represent a socially reinforced form of delay, wherein responsibility is passed upward or outward, consistent with research on distributed accountability and cognitive offloading in command hierarchies (Power & Alison 2017a, b).

By contrast, *Experience and Training* emerged as conceptually and statistically independent from the avoidance-based dimensions. This separation supports the proposition that experiential fluency can serve as a resilience factor, enabling action under uncertainty through procedural knowledge and

learned confidence. This mirrors Klein's ((Klein 1998)) recognition-primed decision model, which emphasised the role of tacit expertise in overcoming cognitive inertia, further supporting Power's (2020) work on decision-making under pressure, where role familiarity and schema-based learning reduce paralysis and improve outcome optimisation.

The intercorrelation structure among these components also revealed distinct patterns of psychological interdependence and divergence that warrant theoretical reflection. Specifically, the significant positive associations among *Decision Paralysis*, *Fear of Blame and Regret*, and *Decision Deferral* suggest the presence of a shared underlying affective-cognitive substrate, likely linked to anticipatory anxiety, perceived accountability, and reluctance to commit under uncertainty. These factors may be an index of avoidance-based mechanisms, wherein individuals may delay or defer decisions in response to perceived moral or evaluative threat, aligning with prior accounts of defensive decision-making and response inhibition under pressure (Alos-Ferrer et al. 2016; Laureiro-Martínez & Brusoni 2018). In contrast, the absence of significant correlations between *Experience and Training* and the other three factors is particularly noteworthy.

This dissociation points to the possibility that *Experience and Training* functions as a compensatory or protective factor, grounded in domain-specific knowledge, procedural fluency, or self-efficacy, rather than as an expression of inertia per se. Its orthogonality to the avoidance-related constructs lends support to its conceptual distinctiveness, suggesting that confidence derived from experiential learning may mitigate the paralysing effects of decision inertia. The alignment between this correlational pattern and the orthogonal factor structure identified in the PCA further reinforces the structural and conceptual validity of the measurement model. Note, while the current study identified a conceptual four-factor structure, future research should seek to substantiate this model using confirmatory factor analysis (CFA) in independent samples to further evaluate its structural validity.

Next, our finding suggests that there was a relationship between WDIS and Bayesian updating, when narrative frames were isolated. Specifically, Non-Grim narratives indicate that individuals with higher WDIS (higher decision inertia) were slightly less likely to update their beliefs in the face of new information. Grim Narratives on the other hand show a moderate to strong negative correlation, suggesting a more substantial effect of decision inertia on belief updating in scenarios where moral dilemmas were framed in a more pessimistic or consequentialist manner. The stronger correlation here implies that decision inertia more significantly impacted individuals' ability to adapt their beliefs in morally complex situations, often converging their decisions to deontological orientations when decision inertia increased. Overall, this finding suggests that people who exhibit higher levels of decision inertia were less flexible in adjusting their beliefs (Alos-Ferrer et al. 2016; Laureiro-Martínez & Brusoni 2018), especially in grim scenarios that challenged moral convictions more profoundly. This effect was less pronounced in non-grim narratives, indicating that the context of the moral dilemma may have played a role in how decision inertia influenced belief updating. However, the lack of correlation between decision inertia and morality orientation suggests that the inherent tendency to stick with initial decisions or beliefs may operate independently of an individual's moral principles or ethical framework (e.g., empathetic ability; Jo and Kim 2017). Note, given that scores were based on previous theories arbitrarily weighted, it is plausible to assume that the lack of correlation might be due to the limited understanding as to why decision outcomes sit within the broader context of ethics (Table 6).

These findings are broadly supported by Alos-Ferrer et al. (2016), who demonstrated participants preference for adherence to previous choices and attributed this to decision inertia. These observations are consistent with our analysis, which identified a negative correlation between WDIS and the ability to update beliefs in response to new, congruent, or divergent information, particularly under grim narrative conditions. Further, Alos-Ferrer et al.'s (2016) regression analysis revealed a positive association between decision inertia and the Prefrontal Cortex (PFC) activity, suggesting that the repetition of past choices stems from a deep-seated need for consistency. Given that participants in the current study typically aligned their decision-making with the initial deontological choices in the pre-immersive morality task, this finding ties in with Pitz's (1969), who noted that decision inertia might be a result of psychological commitment to initial judgments, thereby providing a theoretical foundation for our observations regarding the impact of decision inertia on belief updating in moral dilemmas. However, this is contrary to Zhang et al. (2014) who did not find a correlation between decision convergency in the context of unethical decisions. Our study suggests that the moral narrative framing might have influenced the consistency mechanism differently, offering a perspective on the varied impacts of decision context on inertia.

Table 6 AUC indictors, for non-grim narratives and grim narratives

Predictor	AUC	Predictor	AUC
Grim narratives		Non-grim narratives	
WDIS-1	0.555	WDIS-1	0.654
WDIS-2	0.618	WDIS-2	0.731
WDIS-3	0.467	WDIS-3	0.518
WDIS-4	0.746	WDIS-4	0.706
WDIS-5	0.610	WDIS-5	0.655

The distinction between grim and non-grim narratives in revealing decision inertia's reliance on consistency-seeking mechanisms, and its stronger manifestation in autonomous choices, complemented our findings regarding the more pronounced effect of decision inertia in scenarios involving grim narratives. This explains the role of decision inertia and is further supported by literature on reinforcement learning (e.g., Gershman et al. 2009; Schönberg et al. 2007; Wimmer et al. 2012), which suggested that perseveration of choice is a key component in decision-making processes. In other words, the natural inclination to repeat past choices is not just a habit but a fundamental aspect of how individuals process and respond to decisions, particularity in contexts characterised by high-stakes and an increased propensity toward decision inertia. This was further evidenced by the fact participants in this study favoured sub-optimal decision outcomes, opting primarily to save the hostages. In deontological terms, participants actions were aligned with established deontological moral rules. In this regard, deontological principles likely served as a limiting factor, as they prohibited decision optimisation (i.e., least-worst decision outcomes; Alison et al. 2015) even if those decisions could potentially lead to a more favourable outcome (Bartels 2008). Zhang et al. (2014) suggested that perhaps this could be mediated by 'unethical' decision making. In this study, the principles of deontology and consequentialism became apparent. However, it is important to highlight that the moral framing of the tasks may not have interacted with the consistency for convergence.

This might be explainable by the lack of emotional consequence. For instance, research has shown that ethical framing effects are directly influenced by affective processes (e.g., Weller et al. 2007). It is plausible that the perception of a least-worst outcome generated a different ethical frame beyond deontology or consequentialism. As such, it is appropriate to consider the ethical framing and consider affectivity as a future mediator. Specifically, research has demonstrated that events characterised by affective instability (e.g., critical incidents) can result in more pro-social behaviours, compared to a cognitive process (e.g., distributed probabilities, as seen in Bayesian updating; see, Fetherstonhaugh et al. 1997; Slovic 2007).

Whilst these findings complement previous research in the broad context of ethical decision-making, research to date has yet to identify and rank the factors that might lead to these decision behaviours in high-stakes contexts. To achieve this understanding, our first regression analysis sought to identify the effects of weighted loadings on our WDIS, and the impact of narrative congruency versus divergence, and morality orientation (e.g., deontological versus consequentialist). Initially, our first model (WDIS-1), which incorporated empirically derived weights of decision paralysis, fear of being blamed, decision deferral, and application of experience and training explained a relatively modest 10.8% of the variance in WDIS. This suggests that while the model was statistically significant, it captured only a small fraction of the factors influencing decision inertia. The grim narrative presentation was the only significant negative predictor, implying the potential influence of narrative context on decision inertia. This was particularly interesting, as it turns out that when individuals were in a state of high alert and concerned about making an optimal decision, the default or status quo becomes less appealing.

Interestingly, while our findings demonstrate that grim-narratives can reduce decision inertia, it is important to consider the ethical assumptions within these narratives. Consequentialist reasoning, particularly in emergency contexts, is rarely neutral. It depends on *whose* consequences are being prioritised: those of the victims, the broader public, the perpetrators, or the responders themselves. For example, a decision to sacrifice the life of a perpetrator to save hostages may align with utilitarian logics of collective welfare, but it also raises ethical tensions when viewed from alternative moral perspectives. As Elster (1985) notes in relation to the prisoner's dilemma, individual sacrifices made for collective efficiency may violate commitments to fairness or justice. Moreover, moral relativism (Tasioulas 1998; Freeman et al., (Freeman, et al., 2009)) complicates the interpretation of *optimal* decisions (i.e., actions seen as morally justified in one ethical frame may be perceived as impermissible in another). This suggests that while grim storytelling may reduce inertia, it may also constrain moral reasoning by nudging participants toward particular cultural or normative assumptions about whose lives count and what forms of harm are acceptable. Future work may wish to explore how different narrative framings impact decision inertia and perceived moral legitimacy of the choices made.

Further, the perceived risk of sticking with the default (because of its potential negative outcomes) becomes comparable to, or even outweighs, the risk of making a new decision. Thus, individuals might be more motivated to move away from the default (i.e., lower decision inertia) not because they are confident in their new choices, but because the grim narrative has made the cost of inaction equally or more daunting than the cost of action. In short, the high stakes and pressure created by the grim narrative condition likely led to a re-evaluation of the risks associated with both action and inaction, possibly making any form of action—including changing the decision – seem relatively more appealing or less risky in comparison to doing nothing.

The current study showed the potential oversimplification of complex decision-making processes within the models. Future research should continue to examine cognitive, emotional, and situational factors in tandem that drive decision behaviours. This may necessitate a more holistic approach that considers not only the direct impact of

individual variables on decision inertia, but also the spectrum of their interactions and the potential for complex, emergent patterns of influence. For instance, how does the fear of being blamed interact with decision paralysis in high-stakes scenarios? Or how does prior experience and training modulate the impact of these factors under varying degrees of moral conflict? We conducted a previous study in which we investigated different moral choices in VR using lay and experienced participants in moral emergency situations (i.e., students versus firefighters and paramedics). We found that experienced participants did take the same moral action in VR, however significantly less regretted their decision afterwards, suggesting that moral resilience might facilitate higher decision-making certainty (Francis et al. 2018).

Moreover, the emphasis on narrative congruency versus divergence and morality orientation (e.g., deontological versus consequentialist) in the analysis points out the need for a more comprehensive understanding of how individuals' ethical frameworks and the alignment (or misalignment) of decision contexts with these frameworks affect decision inertia. It seems that beyond the cognitive mechanisms of decision-making, the ethical dimensions of decisions and the moral justifications individuals employ also significantly shape decision outcomes (Cuthbertson & Penney 2023; Navajas et al., (Navajas, et al., 2021); Rebera et al. 2014).

The critical role of the application of experience and training, when weighted heavily ($\delta = 0.9$), explained a larger portion of the variance, with a substantially improved model fit. This highlights the importance of this semantic factor in the decision-making processes. This finding suggests that practical experience and training were more influential in reducing decision inertia than previously considered (e.g., Power & Alison 2017a, b), a result that has implications for how we understand and potentially mitigate decision inertia through education and experiential learning. It might be that experience and training can strengthen an individual's confidence in their decision-making capabilities. In a grim narrative condition, this confidence can counteract the natural tendency toward decision paralysis by providing a foundation of knowledge and past successes to draw upon. Individuals with extensive experience and training in dealing with similar negative scenarios may feel more equipped to identify the challenges, thus reducing the paralysis that comes from uncertainty and fear (Francis et al. 2018). However, the models' relatively low explainability indicating a significant portion of variance in WDIS remains unclear, pointing to the existence of other influential factors not captured by this analysis. This limitation calls for a broader investigation into the psychological, physiological (e.g., sleep – Demos et al. 2016), contextual, and perhaps even neurobiological factors (e.g., Alos-Ferrer et al. 2016) that might contribute to decision inertia.

In the context of the ROC analysis, AUC scores for different WDIS predictors across both grim and non-grim narrative contexts were computed to assess how well these scores could subsequently predict the convergence of decision outcomes. The results indicate a variation in predictive accuracy across different WDIS predictors and narrative contexts. For grim-narratives, the AUC values range from 0.467 to 0.746, with WDIS-4 and 5 showing the predictive accuracy. This shows a strong capability of WDIS-4 and 5 to forecast decision outcomes accurately in grim narratives, indicating a significant association between higher decision inertia scores and the likelihood of certain decision outcomes, when considering information deferral across the chain of command, and importantly, training and experience as a key predictor. However, the AUC values for non-grim were lower than in grim narratives. This demonstrates a moderate predictive accuracy, suggesting that while decision inertia scores can still forecast decision outcomes in non-grim narratives, they do so with less certainty compared to grim narratives.

The variation in AUC scores across different predictors and narrative types reveal the complexity of decision inertia's role in predicting decision outcomes. Specifically, the analysis shows that decision inertia scores, particularly WDIS-5, had a notable predictive validity in grim narrative contexts. Given this, the analysis provides further support that individuals with certain inertia levels are more likely to converge towards deontological decision outcomes. This efficacy in prediction showed the importance of considering the narrative context and individual differences in decision inertia when forecasting decision outcomes.

Multiple regression analyses also reveal that the application of experience and training significantly predicted WDIS, albeit only explaining 6.4% of the variance. Notably, experiential ability emerged as a positive and significant predictor of WDIS, suggesting that individuals with higher experiential ability—those more inclined to rely on intuition, feelings, and past experiences in decision-making—tended to exhibit higher decision inertia scores. This finding suggests a link between the reliance on experiential decision-making processes and an increased likelihood of experiencing decision inertia (Jung et al. 2019). Conversely, the analysis of rational decision modalities—encompassing both rational ability and engagement—did not yield any significant predictors of WDIS. This indicated that rational decision-making processes, did not significantly influence decision inertia. This lack of association might imply that rational decision-making processes, despite their systematic nature, do not necessarily mitigate the tendency to experience decision inertia. Further, while experiential decision-making can lead to quicker, more instinctive choices (see Phillips et al. 2016, for an overview of thinking styles of choice), this study suggests it may also contribute to a greater susceptibility to decision inertia, possibly due to the

overreliance on past experiences or emotions that may not be relevant to the current decision context. However, this intuitive approach may increase vulnerability to decision inertia when past experiences or emotions are misaligned with the current decision context.

Decision modalities phenomena, therefore, align with sunk costs theory (Kahneman & Tversky 1984; Thaler 1980; Kahneman and Tversky 1981), which suggests a reluctance to deviate from a previously chosen course of action, even when it leads to suboptimal outcomes. This reluctance is framed within the concept of loss aversion, where the decision to abandon a chosen path is perceived as conceding to a definite loss, as opposed to the potential for recovery or benefit that might come from perseverance. Consequently, the inclination to persist with a decision, despite evidence suggesting its failure, becomes less aversive. Garland and Newport (1991) emphasised that the intensity of this commitment is proportionate to the sunk costs relative to the overall stakes involved, illustrating how individuals are motivated to continue their chosen path in an attempt to prevent the acknowledgment of these costs as losses. This interrelation between sunk costs, decision inertia, and the framing of outcomes show the significant role of cognitive biases in shaping decision-making processes, highlighting the importance of recognising and mitigating these biases to improve decision outcomes.

On the other hand, the lack of a significant relationship between rational decision-making modalities and decision inertia suggests that while rational processes may benefit in more deliberate decision-making, they do not necessarily protect against decision inertia.

Interestingly, the distribution of choices revealed that a number of participants, 42.4%, were inclined towards the optimal outcome, demonstrating a preference for decisions that they perceived as having a direct, beneficial impact, such as saving the individual victim. On the other hand, the majority, 57.8%, veered towards sub-optimal outcomes, indicating a presence of hesitancy, risk aversion, or a challenge in making decisions that were deemed most effective within the constraints of the scenario.

Our analysis into the mechanisms behind these decision-making patterns, reveal a range of effects. Decision paralysis and decision deferral were notably impactful, with the former showing a medium effect size and the latter a large effect size, both significantly influencing the propensity towards sub-optimal decision-making. These effects suggest that factors such as the avoidance of direct responsibility, fear of repercussions, and a general uncertainty significantly deter participants from making optimal choices. Meanwhile, the fear of being blamed and the application of experience and training exhibited smaller to moderate effects, respectively, indicating their roles in the decision-making process albeit to a lesser extent. These decision-making outcomes against the backdrop of decision inertia constructs shed light on the multifaceted nature of decision-making.

They also show how different aspects of decision inertia—ranging from paralysis and fear of repercussions to the deferral of decisions and the application of past knowledge – might interact and influence the decision-making process. Notably, the variation in effect sizes among these constructs points out that while all contribute to shaping decision outcomes, some have a more pronounced impact, particularly in steering individuals away from making optimal choices. This exploration into the components of decision inertia and their influence on decision-making efficacy opens avenues for targeted interventions and training programmes (Power & Alison 2017a, b). By understanding the underlying factors that lead to sub-optimal decision-making, initiatives can be better designed to mitigate these influences, thereby enhancing the overall decision-making process. Note however, that recent studies failed to replicate previous work on deliberate decisions being optimal (e.g., Aczel, et al. 2011), making the description of a decision being optimal or sub-optimal more complex.

It is further worth noting, the differential impact of factors like decision paralysis, fear of being blamed, decision deferral, and the application of experience and training on decision inertia and outcome measures. This can broadly be understood through the lens of psychological and situational dynamics that shape human decision-making. Each factor interacts with individual predispositions and external contexts in unique ways, influencing decision inertia and the selection of outcomes with varying degrees of intensity. For instance, *decision paralysis* might be impacted by cognitive overload (e.g., Bawden & Robinson 2020) and the anxiety of making a wrong choice (Yang et al. 2015), especially in high-stakes scenarios. When individuals face complex decisions with potentially significant outcomes, the fear of negative consequences can lead to a freeze response (Wester 2011), where making any decision feels overwhelming. This paralysis can be a direct contributor to decision outcome because the individual may be stuck in a state of indecision.

The finding from the chi-squared analysis indicates a significant association between the type of narrative framing (non-grim versus grim storytelling) presented to participants and their decision outcomes (note, this was categorised by a binary measure: sub-optimal vs. optimal outcomes). The analysis suggests a moderate to strong association between narrative framing and decision outcomes. Specifically, the non-grim storytelling narratives were associated with a higher proportion of sub-optimal decision outcomes. In contrast, those presented with grim storytelling narratives made fewer sub-optimal decisions. This significant association in decision outcomes based on narrative framing suggests that the way a scenario was presented can influence individuals' decision-making processes and outcomes (Alison et al.

2022). For instance, the high rate of sub-optimal decisions in non-grim narratives may imply that these narratives, possibly by omitting the harsh realities or consequences typically associated with grim narratives, fail to provoke a sense of urgency or critical reflection in decision-making (Alison et al. 2022). Consequently, participants may not feel compelled to evaluate their choices as thoroughly, leading to a higher incidence of sub-optimal decisions. Conversely, grim narratives, which likely highlight the stark realities and tougher moral dilemmas, seem to prompt participants to engage more deeply with the decision-making process, perhaps due to an increased awareness of the importance and potential consequences of their choices. This, in turn, could lead to more cautious and considered decision-making, resulting in a lower proportion of sub-optimal decisions. Finally, future studies might also investigate this be incorporated models of decision making and actual moral action, since these might have a complex interaction (Terbeck et al. 2021). For instance reduced decision inertia might have a stronger correlation with action intention as well as moral action.

5 Conclusion

At first glance, the results of this exploratory study may seem discrepant, with decision inertia being influenced by various factors, such as narrative framing and morality orientation. However, a closer examination reveals an underlying pattern: the nuanced relationships with cognitive processes and the contextual framing of decisions. Specifically, the study highlights how decision inertia is not merely a static trait but is dynamically influenced by the narrative context—grim versus non-grim narratives—each eliciting different degrees of belief updating and decision flexibility. This interaction suggests that the cognitive engagement required by different narrative contexts can either exacerbate or mitigate decision inertia, offering a deeper insight into how individuals process information and make decisions based on the moral complexity presented to them. One striking observation is the differential impact of grim versus non-grim narratives on decision inertia. On the one hand, the enhanced critical engagement prompted by grim narratives suggests a context in which the stakes of decision outcomes are made more salient, potentially mobilising cognitive resources towards more deliberate decision-making. On the other hand, the less pronounced effect of decision inertia in non-grim narratives might be misconstrued as a potential lack of engagement or critical reflection. However, it could alternatively indicate that in contexts perceived as less severe or morally demanding, individuals may rely more on heuristic or experiential processes, which are not inherently suboptimal but are contextually adapted responses.

Yet, these nuanced interpretations do have practical implications, especially in fields where decision-making under uncertainty or moral complexity is common. For instance, understanding that grim narrative framing can lead to a more critical evaluation of information and reduce decision inertia could inform how information is presented to decision-makers in these sectors. In healthcare, patient communication strategies could be designed to convey the gravity of certain decisions more effectively. This might encourage more deliberate consideration, potentially leading to better health outcomes. Similarly, in public policy and law, where decisions can have wide-reaching ethical implications, the findings suggest that carefully framing the context of decisions could improve the quality of decision-making by reducing inertia and encouraging a deeper engagement with the ethical dimensions of choices. This could be particularly relevant in crisis management situations, where quick, yet optimal, decision-making is critical, and understanding how narrative framing influences decision processes could enhance response strategies.

The lack of a straightforward correlation between morality orientation and decision inertia, however, points to the need for developing training programmes that focus on enhancing cognitive flexibility and emotional regulation, rather than attempting to align decision-making processes with pre-existing moral orientations. Such programmes could be invaluable in professional development, helping individuals in various fields become more adept at identifying and developing strategies for complex decision-making scenarios, enabling an understanding and mitigation of their own tendencies towards decision inertia.

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Data availability The datasets generated by the research during and/or analysed during the current study are available at the Pure Repository, University of Portsmouth, https://researchportal.port.ac.uk.

Declarations

Conflict of interests The authors did not receive support from any organisation for the submitted work. In addition, All authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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