UNIVERSITY OF LIVERPOOL

Conflict: Sacred Values, Decision Inertia and the Psychology of Choice in Military Decision-Making.

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor of Philosophy.

By

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June, 2017

"...a man, being just as hungry as thirsty, and placed in between food and drink, must necessarily remain where he is and starve to death."

Aristotle, On the Heavens 295b, c. 350 BC

"For it's Tommy this, an' Tommy that, an' 'Chuck him out, the brute!'
But it's 'Saviour of 'is country' when the guns begin to shoot."

Rudyard Kipling, Tommy.

ABSTRACT

This thesis focusses on how individuals make hard choices. Specifically, it focusses on the cognitive conflict that emerges when members of the Armed Forces are presented with two options that are equally adverse during combat operations. Such decisions are often high-risk and any resulting decision inertia (a form of "indecision" that I pay special attention to throughout this thesis) can be costly. The issue, however, is that, to date, psychology has done little to explore least-worst decision-making and decision inertia in military populations. To understand the psychological processes behind these types of decisions, this thesis presents qualitative data collected from Soldiers who have combat experience (e.g., in Afghanistan and Iraq). Through my analysis of this data, I then focus on values, and specifically the importance of "sacred" values, as predictors of decision-making in conditions of high-consequence, uncertainty, and least-worst options. I then take a step back, and examine what separates military and non-military decision-making and decision-makers, by studying the decision-making of Soldiers, police officers and students within a series of simulated military and non-military scenarios. Through these experimental studies, I am then able to empirically test the role of value systems in decision-making within and between these groups. Overall, as well as identifying several domain-specific and domain-general correlates of least-worst decision-making, I identify two "clusters" of values (egocentric and empathetic) which, I feel, hold special importance when considering how least-worst decisions are, and are not, made.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank every member of the Armed Forces (both in The United Kingdom and the United States) who took even the smallest amount of time to speak with me over the past 4 years. When I started this Ph.D., I had no idea what a military decision was, I simply had an idea about what the psychological process of making them might "look" like. This Ph.D. was built on the (formal and informal) conversations with the many service men and women who so kindly gave up their time to answer my questions and, in many cases, who gave up multiple hours of their time to talk to me in detail about a decision they had made. I am truly grateful for all the help and support they gave me. Borrowing the words of the war reporter Rick Atkinson, "my gratitude is matched only by my admiration."

Professor Alison, you have been an incredible supervisor, inspiration and friend. Working alongside you was a joy and privilege. While my gratitude for your help on the Ph.D. is without question, it is our wider work together that excites me the most; our book, our on-going grants, and the many projects we will work together on in the future. Going wider still, there is an entire cast of people at Liverpool who have helped me throughout this process; Michael Humann, Sara Waring, Nicola Power, Susan Giles, Chloe Barrett-Pink, and Lauren Swan. There are also several people at my own institution whose support was invaluable; Matthew Cherkerzian, Luis Falcon, Andrew Harris and James Forest. Each of these, in their own way, played an important role in helping me over the past 4 years.

Given that a lot of the academic thinking behind this Ph.D. occurred in informal conversations with friends (and usually on the golf course), I would be remiss without acknowledging the help and support I received from Ian Elliott, Ben Grindley, and Matthew Crayne.

Finally, I owe the most to those closest to me; Josie, Mum, Dad, Jenny, Mark, Sarah, Thomas, William, Clementine and Scott Green. And of course, Nola and Olly; our two new kittens who, as I write this, are trying to sit on/eat my computer.

PREFACE

"I would rather go down this street and get in a firefight than go back and get blown up by an IED. This thought was resounding, and I would not forget it, I would rather get in a firefight than face an IED"

This quote was recounted to me in one of the first interviews I conducted for this thesis, and it describes the dilemma of a convoy leader in Iraq. While providing security for a convoy running between Baghdad and a forward operating base, he found that his planned routes (route A; preferred, and route B; not ideal, but workable) had been blocked, randomly, as often occurs in Iraq. A quick decision was needed since they were fast approaching the roundabout. Option 1 was to take route "C," a new, unplanned route that would lead directly through a troubled part of town—meaning that it was a known hotspot for insurgent fighters, and most times coalition forces had navigated this part of town they had come under fire. Option 2 was to turn around, backtrack and then go around the center of the city (rather than through it via route C, which was both shorter and faster, getting them and their cargo back to base sooner). A further wrinkle was that the convoy leader knew insurgent fighters laid improvised explosive devices (IEDs) on common coalition routes, meaning there was a high chance the route they had just travelled (and were now considering backtracking through) would be laced with IEDs. So, in incredibly challenging physiological and psychological conditions, he was forced to make a decision that had high consequences; there was no "right" answer (at least not a right answer that would be apparent until *after* the decision was made), high uncertainty, and little time. He was unlikely to have made this specific decision in training, nor had he faced this decision during his previous tours of Afghanistan. So, how did this Soldier make this decision? And, crucially, how can psychologists better understand the processes people use to make these seemingly impossible decisions in challenging environments?

These were the questions in my mind when I began looking at military decision-making. I have often felt that the current theories (rational, economic and recognition-primed) do not satisfactorily explain (some) of the decisions people face in high-risk, high consequences situations. In working under the supervision of Prof. Alison, I became specifically interested in what he called "least-worst decisions," something he had observed extensively in his research on

police and Emergency service decision-making that he had been conducting over the past few decades. Strangely though, very little work had explored least-worst decisions in a military context. Given this, we set out on a journey to understand what least-worst decisions in the time-limited, information-starved, inveterately-ambiguous heat of battle mean for the decision-maker, and how they perform the calculus needed to commit to a decision and accept a (potentially) bad outcome. We were also very committed to ensuring we collected data from real decisions made in the heat of battle because the existing research has often studied how Soldiers[1] are *trained* to make decisions or how they make decisions *in training*. Very rarely does research collect data from the points at which real decisions are made and the *types* of decisions made when it counts: at war.

My early research as part of this thesis unearthed several interesting findings about the process of military decision-making. Firstly, the *types* of decisions that Soldiers struggled with continued to surprise us. The decisions that were discussed, while often high-risk, and involving issues of life and death for their forces and civilians, were rarely "kinetic" (meaning that they were not decisions faced in combat), but more often they were encountered during the mission planning process. Furthermore, these decisions were often not merely "hard" because of the costs (something which has always intrinsically been linked to the difficulty a decision poses, as covered in Chapter 1). More often they were hard because they came from "left field" -- meaning that the decision was completely unexpected; one that they had never trained for, and a situation they usually did not expect to encounter. There are some decisions that time and time again caused Soldiers difficulties, such as how to determine a threat, but strikingly the decisions we examined arose in unique situations that posed unique decisions.

One of the things that also struck me throughout this research was the vividness with which the Soldiers remembered these types of decisions. During any operation, on any given day, on any deployment, a Soldier can make hundred (one even said millions) of decisions, yet our participants could always recall a least-worst decision in incredible detail, as many as 15 years after it first occurred. While this provided much-needed detail to the qualitative data, this highlights serious concerns about the enduring effects on Soldiers of making these kinds of decisions. So, while they tolerated a bad outcome during goal-directed, short-term actions, are the long-term consequences potentially intolerable? In discussing this research with a trained veterans' counselor, she said we

[1] While the term "Soldier" typically denotes members of the Army in using this term here, and throughout this thesis, I am referring to members of all branches of the Armed Forces.

were studying "*shoulda, woulda, coulda*" decisions; decisions that haunt the Soldiers and "come back with them." From this research, we can confirm that, in many cases, decision-makers continued to ruminate on the outcome of a decision years after it had originally occurred. While this thesis is not focused on issues of post-traumatic stress disorder in combat veterans, this reinforces the importance of understanding both the short-term process of making, and the long-term psychological consequences of living with, least-worst decisions.

Through a series of qualitative interviews with veterans of the wars in Afghanistan and Iraq this thesis describes the processes that make choice selection so difficult, the psychology of decisional conflict, and the immediate, short-term behavioral consequences of experiencing this conflict. Special attention is directed to the concept of 'decision inertia' – one of several kinds of 'failures to act' in which decision-makers are unable to calculate and/or commit to a least-worst course of action. Emergency services and law enforcement personnel seem especially prone to the inability to tolerate any bad outcome —the military far less so. While this assertion was originally just an observation made after conducting the interviews, we test this assertion in the later chapters of this thesis. Hence, in the final chapters of this thesis, I expand this analysis. We use experimental methods, to investigate *if* Soldiers are more tolerant of a least-worst option, and thus less prone to decision inertia. We also look to universal predictors of performance to identify what makes a good "least-worst" decision-maker, and what makes a bad one. Here we pay critical attention to individuals' value systems; arguing that it is the presence of values that best explain the processes underpinning least-worst decision-making.

Overall, this thesis is about difficult decisions. It sought to identify, and then explore the cognitive and affective conflict that people experience when faced with choices where all outcomes look adverse. It draws on interviews that we conducted with real Soldiers in real situations and focuses specifically on the seemingly impossible choices that they had to make – choices that were vivid and sometimes upsetting for them and yet were part of their experience of war and which have stayed with them throughout their lives. Hence, while this thesis is primarily about the psychology of making choices, we hope that this work increasingly becomes entwined with the psychological consequences of living with the outcomes of hard choices.

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CHAPTER 1: DECISION-MAKING: FROM BEST TO "LEAST-WORST"

Between two evils, choose neither; between two goods, choose both.

- Tryon Edwards

This thesis is about difficult decisions. Specifically, it is about the cognitive and affective conflict that occurs when choosing between difficult options.

This thesis starts by looking at what we know; that is, it is examine the current understanding of how general, and military decisions are made. After analyzing these multiple perspectives and highlighting some issues with both as they relate to decisions made my members of the military, operating in extreme environments, it moves on to examining research on how other extreme decisions are made, namely those within critical and major incidents. From here, we identify several psychological factors that are highly relevant to military decisions, but currently ignored. Furthermore, we discuss the importance of decision inertia and the overlap between the environments within which inertia emerges and the environment within which military decisions are made. From this standpoint, and using primary source data collected from soldiers who have operated in war, we explore the manifestation of inertia within military decision-making finding, to our surprise, that it is a rarity and that in the face of critical least-worst decisions, members of the military are often able to maintain relatively robust decision making. Through further primary source data collection we then explore the psychological underpinnings of this finding, centering on the importance of values and value systems. Finally, and as the final piece of this thesis, we use experimental scenario-based methods to explore the values and decision-making of Soldiers, and several unique control groups (namely members of the Police and a undergraduate student sample).

In this chapter, I will discuss what is a decision, what makes decisions "hard," and crucially what makes decisions "good" or "bad." I will critically address what is referred to as the "decision quality thesis" and the idea that there are "better decisions… that have quality superior to that possessed by "worse decisions" (Yates, Veinot & Patalano, 2003, p. 14). I will pay special attention to this assumption because while there are better *outcomes* to decisions, these outcomes are not always directly correlated to better decision-making (i.e., bad decision-making can have good outcomes, and good decision-making can still result in bad outcomes). As an important pillar

throughout the rest of this thesis, at the end of this chapter I seek to define what is a "hard" decision as well as a "quality" decision within a military decision-making environment. In this chapter, I also outline the concept of decisional conflict. Decision conflict occurs when we have two (or more) similarly attractive (or unattractive) options to choose from and it can often lead to suboptimal decision-making (Pochon et al., 2008). Decision conflict has been observed and studied since the 1970s (e.g., Janis & Mann, 1977), yet has been almost exclusively applied to consumer decision-making. Hence, it has not been applied to decision-making in high-stakes, uncertain critical or military incidents. Given the central importance of decision conflict to this thesis in this chapter I will also discuss the psychological issues underpinning decisional conflict, as well as the consequences of experiencing it.

What is a "Hard" Decision

Over the past several decades, many fields of study have concerned themselves with how people make decisions. Philosophers, mathematicians, economists, psychologists, political scientists have each attempted to understand how people make decisions in various domains and under various conditions (e.g., Payne, 1976; Plous, 1993). Synthesizing how the term "decision-making" is used across and between these many fields Yates, Veinott and Patalano (2003; see also Yates & Patalano, 1999) defined a "decision" as "a commitment to a course of action that is intended to produce a satisfying state of affairs" (p. 15). However, not all actions are as easy to commit to as others, henceforth the harder it is to commit to a course of action, the harder the decision is to make. In line with this view, Yates and colleagues (2003) asked the simple question of what makes decisions "hard" or "easy" to 93 undergraduates psychology students. He asked them to "imagine hard and easy decisions that you have made within the last year" and write down three decisions that were hard and three decisions that were easy. They were asked to describe the circumstances around the decision, explain why it was hard (or easy) and then outline how they solve a given problem. Finally, they were asked to highlight how many options they *could* choose from, how long the decision took, the degree of difficulty they experienced making the decision, how satisfied they were with the outcome and the extent to which they felt that the decision they made was the best possible decision given the circumstances. This method, while arguably quite simplistic, is not that dissimilar from the method that I used later in this thesis to collect narrative

accounts from Soldiers' about difficult decisions they made while on deployed duty in Afghanistan and Iraq.

In total Yates' research resulted in an outline of 212 "hard" decision and 200 "easy" decisions. Given that the sample was entirely college undergraduates, it is not surprising that decisions defined as "hard" centered on academic issues (what college to attend); social issues (who should I date/not date) and financial matters (should I buy a car, and if so, which one). However, given that Yates' also sought to understand *why* decisions are hard (rather *what* decisions are hard) they coded the participants' responses for the attributions they assigned to hard decisions. From this analysis, the authors identified 7 *supercategories* (an amalgamation of the 29 "hardness" categories) which could be used to categorize a given form of hardness. These seven categories are outlined below:

Hardness Factor 1. ***Outcomes - Serious:*** Decisions in which the outcome could result in a "serious loss of some kind." Participants most often cited losses which were "long-term, with potentially irreversible, effects, ones that entailed hurting another person, ones that required violating personal (e.g., moral) principles." Outcomes that involved significant risks were also within this supercategory.

Hardness Factor 2. ***Options:*** Decisions that burdened the decision-maker with the number and/or nature of the choices available to them. Decisions therefore that had either too many or too few options, as well as those which had comparisons on too many factors, were viewed as hard.

Hardness Factor 3. ***Process – Onerous:*** Participants in Yates' study stated that decisions were hard if the amount of effort required to make the decision was high, there were emotional circumstances, time pressure, uncertainty and a feeling that they (the decision-maker) lacked the experience of expertise.

Hardness Factor 4. ***Possibilities:*** Decisions were viewed as hard if it was difficult to imagine, or predict, what the possible outcomes could be. This was especially relevant for decisions in which the decision-maker had little experience of the type of decision they were making (e.g., buying your fist house/car/choosing college).

Hardness Factor 5. ***Clarity:*** Decisions were viewed as hard if it was unclear *which* possibility was superior in relation to the others it was being compared against.

Hardness Factor 6. ***Value:*** Decisions were perceived as hard if the decision-maker was unsure how they would feel about a given potential outcome. For example, they may have never experienced that outcome (e.g., being a doctor or lawyer) and therefore they were unsure whether (and the degree to which) this would be a pleasurable outcome and is worth the costs (several more years of college and incurring increased debt).

Hardness Factor 7. ***Advisors:*** Participants said that decisions became hard when they either had opposing advice from advisors, or the advice being pushed from the advisor contradicts the decision-maker's preference.

Contrary to this then, "easy" decisions were (logically) defined as those with mild outcomes, a clear optimal option, little effort is required to decide, predictable outcomes (and predictable personal responses to these outcomes), and the ability to defer (and follow) an advisor.

Finally, Yates coded for the presence of hardness and easiness factors within the 412 decisions reported by his participants. This was done to understand what most commonly makes decisions hard or easy. The results of this analysis are displayed in full (from Yates et al., 2003, p.24) in Table 1 but of central importance here is that the most common reason a decision was viewed as "hard" was because there were serious *outcomes* to the decision. What this means then is that even research that specifically seeks to understand what makes decisions hard (i.e., choosing a course of action and implementing it) remains pre-occupied with defining decisions based solely on the outcomes of the decision. This finding has two implications; Firstly, it belittles the challenges that are posed by the choice itself (i.e., the independent metrics of each course of action and the difficulties that can stem from evaluating them). Secondly, by its very nature, this means that all decisions with serious consequences are *ipso facto* hard. While this makes intuitive sense, it is not reflective of the fact that, in many high-risk and high consequence situations, individuals in many fields can (with relative ease) make decisions. Furthermore, given that Yates' research found that hard decisions demanded more time to solve, this means that decisions with high-risk outcomes will take more time. Not only is this not the case, but in such situations taking more time is a significant issue, hence why we so often value those who can make high-consequence decisions in time-short environments. For example, as the surgeon James Bonnar wrote in 1824 (Bonnar, 1824, p. 33);

> *"A hesitating practitioner, who takes a few hours only to make up his mind respecting the course he is to pursue in the treatment of a doubtful disease, may often thus doom his patient to an irretrievable state. I hold it as a maxim, that it is more culpable for a physician to lose his patient by neglect or indecision when it might be in his power to save him, than it is one who hurries on the fatal termination by the use of desperate measures in a desperate disease."*

Thus, decisions cannot be viewed as hard solely on the consequences of their outcomes because for many individuals there are serious consequences to all decisions. In addition, in such situations, the decision-maker does not have the luxury of time, and in fact taking too much time can only lead to further harm. Given this then, it is important that we create a double dissociation between hard decisions and high consequences because (while acknowledging that outcome severity is one of many factors that can make decisions "hard") decisions with high-consequences can be made with relative ease, and decisions with low consequences can equally be incredibly tough to make (for example picking a main course at a restaurant, or deciding which item of clothing to wear on a date). Thus, if we move the concept of "hard" decisions away from simply the outcomes of decisions and towards the factors within the decision itself (and the nature of the choices on offer) we can expand our conceptualization of hard decisions, showing how decisions with both low and high consequences can be hard to make.

Supercategory	Percentage
Outcomes	
Hard (Serious loss potential)	69.8%
Easy (Insignificant)	17.5%
Options	
Hard (Too many/few, Character)	10.8%
Easy (Minimal reflection required	21.0%
Process	
Hard (onerous)	22.1%
Easy (apparent)	31.0%
Possibilities	
Hard (Obscure)	8.0%
Easy (Apparent)	15.0%
Clarity	
Hard (Ambiguous superiority)	23.1%
Easy (Obvious superiority)	41.5%
Value	
Hard (Uncertain)	7.5%
Easy (Clear cut)	21.5%
Advisors	
Hard (Disagree)	5.1%
Easy (Recommend, Encourage)	4.5%

Note: Hard and easy supercategory percentages sum to more than 100% because participants typically cited more than one reason that a given decision was hard or easy.

Table 1: The prevalence of harness and easiness supercategories across "easy" and "hard" decisions.

Decisions in "Hard" Environments

For the past 20 years Alison and colleagues have been using naturalistic observation and conducting anonymous debriefs of critical incidents to better understand the factors present within the decision-making environment that are repeatedly present in "hard" decisions (see Alison & Crego, 2008). In their work with Emergency services, two factors continually separate hard choices from easy ones; task ambiguity (not being clear on exactly what the task at hand is) and outcome uncertainty (not being clear on what the precise consequences of your decision will be). This can be mapped out in two orthogonal dimensions (see Table 2).

	Clear task	Ambiguous Task
Certain Outcome	Easy decision	Hard decision
Uncertain Outcome	Hard decision	Very hard decision

Table 2: Task Ambiguity-Clarity and Outcome Uncertainty-Certainty and decision hardness.

Hence, in their work, it is not the costs of the outcome that define decision difficulty, but the degree of certainty with which we can be sure that a certain outcome will occur. Furthermore, and not captured in Yates' work above, the second dimension of decision difficulty is the degree to which we are clear of what our task is within a given environment is. Hence it is these factors, rather than merely a high-cost outcome, that defines "hard" decisions. To put this point in perspective, consider Table 2 as part of an imagined 'bomb' paradigm where options available to you are cutting a red or blue wire to disable a bomb (see Table 3). Now, the outcomes of the decision are high (a bomb going off), but if you know that you are supposed to cut the red wire, and you know that this will disable the bomb, this decision becomes quite easy. However, if you are unsure which wire you are supposed to be cutting, and unsure if cutting either wire will disable (or in fact trigger) the bomb, the decision is much tougher to make. What this example seeks to show is that outcomes and decision difficulty must be de-coupled, and that whether a decision is challenging or not is a result, not of consequences (although they do play a role), but of the degree

of certainty with which we can be sure about a: what we are supposed to be do, and b: what will happen if we do it.

	Clear task	Ambiguous Task
Certain Outcome	A. Cutting the red wire disables bomb	B. Cutting the red OR blue wire will disable bomb
Uncertain Outcome	C. Cutting the red wire may disable or may detonate bomb	D. cutting the red OR blue wire may (or may not) disable or detonate bomb

Table 3: Task Ambiguity-Clarity and Outcome Uncertainty-Certainty regarding a hypothetical bomb paradigm.

Least-Worst Decisions

> "A hungry donkey stands between two identical hay piles. The donkey always chooses whichever hay is closest to him. Both piles are exactly the same distance apart, one on his right, one on his left, and they are identical in every way. Which pile of hay will the donkey choose to eat?"

The above paradox, while originally proposed by Aristotle (see the quote at the start of this thesis), was made famous by the French Philosopher Jean Buridan as a central argument against free will. According to this paradox, the donkey will be unable to choose and will, in turn, starve to death in the paralysis of choice. While commonly used in political satire, this philosophical conundrum reflects a common observation that when people face equally attractive (or unattractive) choices they can become paralyzed.

In naturalistic fields, based on findings from research on decisions in real-life critical incidents, researchers have called these types of decisions "least-worst" (see Alison, Power, van den Heuvel, Palasinski & Crego, 2015). Least-worst decisions are those in which every course of action is high-risk, and could (potentially) have negative consequences that are equal to the negative consequences that could result from selection another course of action. What defines

least-worst decisions is that *all* courses of action are adverse. Such decisions pose a significant problem to current perspectives on decision-making that hold that there is an *ideal, best,* or *workable* solution to a problem (see Chapter 2 for an expanded discussion of this). Let us consider, for example, the decision-making of President Obama surrounding intervention in Syria. Since the emergence of unrest in March 2011, the Syrian conflict seemed in an inevitable descent into civil war (Nicoll & Delaney, 2012). The case of Syria is not unique but reflects a growing trend in international security of failed (or failing) states (that is those in which there is ethnic and sectarian violence, weak institutions that are unable to exert control and little rule of law) that potentially require third-party intervention. Decisive action to mitigate the emergence (or spreading) of violence did not occur in Syria, and levels of violence have not only escalated throughout the last five years but spread into Iraq, Turkey and Lebanon. The Syrian conflict has also threatened the peace between Syria and Israel, increased fears for the proliferation of Weapons of Mass Destruction (WMDs) by terrorist organizations and exacerbated the United States and Russian international relations (Allison, 2013; McComb, 2013). While many have been quick to lament the indecision of the Obama Administration, when you look at the options available, none of them offered much promise. As (then Secretary of Defense) Hillary Clinton (2014) states "Do nothing, and a humanitarian disaster envelops the region." However intervention opened a "Pandora's box" and arms given to the rebels could end up in the hands of extremists. Diplomacy would, in her mind, "run head-first into a Russian veto." None of these offered much hope of success (p. 461).

The United States Senator John Kerry defined Syria as a "wicked problem" in that it presented a situation that has innumerable causes that are hard to describe and have no "right answer." (Kerry 2013). While the case of Syria (as well as many other intervene/not intervene decisions such as Iraq – both in 2003 and 2015) represents a very strategic-level least-worst decisions; these types of "damned if you do; damned if you don't" decisions are equally likely to emerge at the tactical level, *especially* in a conflict environment. Consider, for example, the following situation encountered by a Marine Officer (recounted in Friedman 2007):

> "Suddenly the guy reached down and picked the object up. "Hey what the fuck! Drop that motherfucker!" I screamed, raising my weapon. I started moving backward. Mohamed started shouting at the guy and the guy started talking back to

> him, all the while smiling and shaking the yellow object… In my mind, I quickly started to work out the combat calculus that would tell me how to deal with this…. Everyone was yelling at the same time. I didn't want to have to shoot this guy over a misunderstanding, but dying for this guy's stupidity was not an option either. This was the same thing that happened to Charlie Company and the Iraqi who died right in front of me. Given the choice, I would shoot first and ask questions later. This was not how I was going to die" (p. 162 - 163)

While this presents a simple tactical shoot/don't shoot scenario, neither option is (potentially) workable as the decision-maker risks either a: shooting an unarmed civilian, or b: putting the lives of himself and fellow Soldiers at risk by not taking offensive action. This type of situation (cultural misunderstandings leading to a least-worst decision) was also, arguably, quite common in Afghanistan given the significant cultural differences, and language barriers between troops and the civilian population. Either decision could have resulted in significant negative repercussions.

What this tactical decision and the overarching global political decisions surrounding intervention in Syria have in common is that the decision-maker faces multiple high-risk courses of action, all of which could, potentially, have adverse consequences for the decision-maker, their organization, and civilians. In such instances, they are not selecting a "best," or even "workable" course of action, but instead they must select the "least-worst." These types of decisions place the decision-maker in a very challenging position because, when considering option comparison, there is no better solution, yet they are required (due to the nature of the environment in that is time-pressured) to decide.

The reason least-worst decisions are so challenging, both for the decision-maker and the those who study decision-making is that they violate the fundamental principles of optimization and satisficing. Those who study organizational decision-making have long described the optimizing strategy of selecting courses of action which provide the greatest payoff (e.g., Svenson, 1979). Such economic models propose that humans make decisions based on expected benefits (this is discussed in detail in Chapter 2) however, as argued by Simon (1976) humans do not have the "wits" to maximize (p. xxviii). As Simon argues, determining all the (potential) favorable and unfavorable consequences of all feasible actions would over-stretch the limited cognitive

capabilities of humans. Instead, Simon (1955, 1956, 1957) proposed that decision-makers satisfice. This approach is more cognizant of cognitive limitations in that we do not need to search for (and select) the optimal choice, but rather we have a threshold of acceptability. Once the decision-maker finds an option that exceeds this threshold it is chosen. Such strategies are beneficial if they save enough cognitive effort to justify any (potential) loss in the payoff (Simon, 1955, 1956, 1957). Satisfying has been the topic of scholarly investigations for several decades and is supported by the oft-espoused view that we are "cognitive misers" who try to good decisions while expending minimal cognitive effort (Fiske & Taylor, 1991).

Satisficing is a central facet of current perspectives of decision-making but least-worst situations often present with no "workable" option, or options that are equally "unworkable" (none of which would be viewed as "ideal" and all of which have an unpalatable outcome). Furthermore, if a course of action would meet a "threshold of acceptance" is often something, in high-risk adaptive environments, that could *only* be known *after* the decision is made. It is in situations such as this, decision-makers often struggle to select between equally bad options. In Chapter 2 I discuss in detail the recognition-primed model of decision-making (RPD; in which you use previous experience to help you identify workable courses of action). However, again, such perspectives remain almost silent on what to do when no option is workable. RPD researchers call facing equally adverse options the "zone of indifference". Within the zone of indifference, the closer the advantages and disadvantages of two options, the harder a decision is to make, and the less an evaluation of the options will matter (Klein, 1998, p. 103). As such, in such instances, decision-makers should stop ruminating, make an "arbitrary choice," and move on (Klein, 2011, p. 87). The issue then, is that when in the "zone of indifference," and especially within a high-stakes decision-making environment, decision-makers rarely make an "arbitrary" choice. Instead, and as shown by Alison et al. (2015) and van den Heuvel et al. (2012) decision-making is usually derailed when individuals find themselves in the zone of indifference. Moreover, the term "arbitrary" sits uncomfortably when it comes to, for example, shoot/no-shoot decisions, or the decision to deploy troops to Syria (or don't). These difficult to calculate options, in which it is hard to discriminate the least-worst long-term outcome cannot *really* be considered as arbitrary because they are often fundamental, life-shaping events for victims, communities, countries, Governments and Soldiers.

To re-frame all of this in Buridan's terms; the donkey starves because it becomes paralyzed in the face of a least-worst decision due to a zone of indifference between the two bales of hay. It

is here then, at the junction of least-worst decisions, where decision-making is at its hardest and where our current conceptualizations of decision-making falter.

Decision Conflict

Least-worst decisions create decision conflict. Janis and Mann (1977) argued that decision-makers experience intense conflict when facing opposing tendencies to accept or reject a given course of action. Such opposing tendencies result in hesitation, feelings of uncertainty, and acute emotional stress (Janis & Mann, 1977, p. 46; see also Tversky & Shafir, 1992). When making such decisions common symptoms include apprehensiveness and a desire to escape from the choice dilemma. In Simon's analysis of emotion in controlling cognitive processes anxiety, while unpleasant, allows the processor to adapt adaptively to urgent needs. However, when the emotional arousal is extremely intense (and hence unpleasant) it becomes disruptive and produces non-adaptive behavior. The view that adaptive emotional processes become maladaptive at under conditions of heightened arousal is the central tenet of Janis and Mann's "conflict theory of decision-making" which outlines the conditions under which stress caused by decisional conflict will interfere with good decision-making (Janis & Mann, 1977, p. 49).

Physiologically, people show an increased stress reaction when they are required to choose between two alternatives that can have unpleasant consequences (Mann, Janis & Chaplin, 1969). Specifically, participants showed the greatest levels of autonomic stress arousal during the time when they were deciding between the two (unpleasant) alternatives and when they were expected to announce their decision (see also; Gerard, 1967). Epstein and Fenz (1965), for example, found that the greatest levels of stress for parachute jumpers was not during the ascent and prior to the jump, but at the point in which they made the *original* decision to participate. Furthermore, the degree of physiological and psychological stress symptoms experienced is directly related to the *perceived magnitude* of the anticipated losses (Janis & Mann, 1977, p. 49).

Extending this analysis Janis and Mann (1977) examined the different decision strategies that can be employed when experiencing "conflict." *Vigilance*, they argue, is the adaptive decision-making strategy, involving "a thorough information search, unbiased assimilation of new information and other qualities of high-quality decision-making" (p.52). Vigilance, however, is only one possible outcome, the other outcomes "though occasionally adaptive in saving time,

effort, emotional wear and tear …. often result in defective decision-making when the decision-maker is confronted with a vital choice that has serious consequences for himself, for his family, or for the organization" (p. 52). The first defective outcome identified by Janis and Mann is *unconflicted inertia;* in which a decision raises little emotional arousal and the decision-maker maintains the status quo (i.e., they engage in no decision-making process). The second possible outcome, *unconflicted change*, occurs when the decision-maker, after deciding to consider other courses of action find that the alternative course of action offers no serious risks. In those instances, in which a new course of action carries with it a degree of risk the individual will continue to search for new alternatives, if, however, they feel that there are no good alternatives open to them they will give up on the search, entering a state of *defensive avoidance*, in which they minimize threat cues or develop "fatalistic beliefs that support a precariously optimistic outcome" (p. 58). Finally, if the decision-maker continues to engage in a vigilant search and evaluation of new courses of action, but does not have the time to do so, they can enter a state of *hypervigilance*. When a threat is highly imminent there is a heightened emotional arousal (Kelly, Condry, Dahlke & Hill, 1965; Monat, Averill & Lazarus, 1972), lowering the efficiency of cognitive functioning leading to constriction and errors in judgment that accompanies high emotional arousal (Easterbrook, 1959). This model is therefore centered around a subjects' perceptions of three antecedent conditions; (1) awareness of risk if no decision is made, (2) the hope of finding a better alternative and (3) perceptions of the quantity of available time to choose the best alternative; their perception of which will dictate the decisional conflict pattern than emerges. Based on their perception of these factors the individual may (a) engage in a vigilant information search and solve the problem, (b) become hypervigilant and search for a solution in a state of panic, (c) defer the responsibility for the decision to others, or (d) procrastinate and escape the conflict. Decisional conflict, therefore, creates intrapersonal tension between what people want to do versus what they think they should do (Mann, Burnett, Radford, & Ford, 1997).

Janis and Mann's conflict model of decision-making has been used to study decision-making in a range of context, from student procrastination (Beswick, Rothblum & Mann, 2011), to decisions surrounding safe sex (Chambers & Rew, 2006). In addition, by using the Melbourne Decision-making Questionnaire (a measure of an individuals' preference to engage in vigilance, hypervigilance, buck-passing or avoidance: Mann et al., 1997), researchers have now been able to not only confirm the relevance of these four basic coping strategies in Australia, New Zealand, the

United States, Japan and Hong Kong (Mann et al., 1997) but researchers have also begun to identify individual differences that can predict which type of behavior an individual will engage in when experiencing decision conflict. Bouckenooghe and colleagues (2007), for example, found that individuals who scored highly on measures for "Need for Cognition" (i.e., defined as "the tendency of an individual to engage and enjoy thinking" (Cacioppo & Petty, 1982 p. 116) were less likely to pass the buck.

More recent naturalistic research also reflects many aspects of the conflict Janis and Mann's model. Firstly, naturalistic observation of decisions that are made by police officers, emergency planners, and members of the Armed Forces supports that individuals experience conflict when presented with equally attractive (or more often unattractive) options (Alison et al., 2015). Furthermore, and as shown in research using a simulated counter-terrorism operation, when decision-makers are under states of decisional and interpersonal conflict they act in a maladaptive manner. I expand further on the consequences of decision conflict (specifically as it relates to indecision) in Chapter 3.

Decision Error: Outcomes vs., Processes

Before going forward, it is prudent that we critically discuss the terms "errors" and "maladaptive" as they refer to decision-making because it is important that we de-couple errors in the decision-making process with errors in the outcome of a decision. The definition forwarded at the start of this chapter states that a course of action is "intended to produce a satisfying state of affairs." Within this definition then quality central to the very idea of a decision (Yates et al., 2003). So, what makes one decision "better" than another? This issue is of further importance given that the wealth of psychological (and economic) literature that then aims to identify who is a "better" decision-maker or produce aids that "create" "better" decision-making. This is widely referred to as the "quality thesis" in that it implicitly states that there are "good decisions" and "bad decisions," and that these can be assessed by the choice of action chosen. Thus, we hold that in most cases one decision has a higher quality than it's competing alternative. Such outcomes, therefore, have an implicit "superior" quality to those within (what is viewed as) the "worse decision." However, what makes a quality decision is not a unitary construct, instead it consists of

several distinct facets, each of which consists of a individuals own notion of success (Yates et al., 2003, p. 15).

Below I discuss this issue of "better" decisions (and hence, "better" decision-makers) with special reference to decisions made in uncertain, complex environments (such as those made in war). Furthermore, I propose that, often, "better" decisions are only known in hindsight, but they are often in no small part the result of external (uncontrollable) factors such as the behavior of an opposing force and (sometimes) luck. As such I advocate that a more pressing concern is to focus on better decision-making; as a process, rather than an outcome. In doing so I outline the work of others on inertia, a cognitive phenomenon of indecision which results in a failure to act. This, I (and they) argue, often results in far worse outcomes.

This view that there exist "better" decisions stems from an exclusive focus on decisions in economic, multi-attribute situations. For example, Consider, for a moment, a paradigm commonly used in traditional lab-based studies of decision-making:

> "A bat and a ball cost $1.10 in total. The bat costs $1 more than the ball. How much does the ball cost?"

Because the sum $1.10 separates naturally into $1 and 10 cents and because 10 cents is *around* the right magnitude, people tend to answer "10 cents". This is clearly a wrong answer (although 50% of Princeton students gave the wrong answer when presented with this exact conundrum; Kahneman & Frederick, 2002; Kahneman, 2003). This example was developed by Nobel-prize winner Daniel Kahneman and Amos Tversky and shows the role of heuristics and biases in decision-making (see Chapter 2 for a more detailed discussion of this). But, importantly, in this case, the "wrong" decision is clear. Furthermore, in those who gave the wrong answer we can clearly infer that they engaged in an incorrect decision-making process; namely that they let their "System 1" (the brain's fast, automatic and intuitive processor) provide the answer, rather than engaging in a more deliberate analysis that employed "System 2" (the slower, analytical, more reasoned processing center; see Kahneman, 2011). So here we have a clear *wrong* decision that is evidence of a *worse* underlying decision-making process.

A more complicated type of decision is a multi-attribute decision but one within which we can equally attribute "error" is multi-attribute decisions. Multi-attribute decisions are a class of

decision in which the outcomes have several different dimensions of value (Schmitt, 1994). To navigate multi-attribute problems a decision-maker must navigate preferences over a series of outcome variables; the *best* decision then is that which, across all outcome variables, has the *best* outcome vector. In mathematical terms, if the notation x_i denotes the i^{th} attribute of a decision, then the total outcome vector (V) for a course of action is $x_1 + x_2 + \ldots x_3$. Thus, for an outcome to be preferable, it's vector should be greater than the alternative ($V_1 > V_2$). Choosing a car is a prototypical multi-attribute decision. When choosing a car, we juggle with several different criteria; numbers of seats, price, economy, insurance costs. The best decision here is thus the one that, overall, has the highest evaluation across all variables. Choosing a house is a similar decision. Multi-attribute decisions have several important differences to the kind of decision presented above. Firstly, the best choice is (to varying degrees) not absolute, and can differ between individuals. For example, the "utility" of a car is dictated by the needs and values of the decision-maker; a two-seater sports car has little utility for a family of four; whereas a family sports utility vehicle offers redundant space for a couple with no children (nor the want for any soon). Secondly, vectors for a given choice can change based on time and the environment; meaning that the "ideal" decision is time-bound. For example, the price may be a vital attribute in a decision-makers' calculus, however, if they suddenly come into a significant quantity of money that attribute will change. Thus, within multi-attribute decisions, the best decision is that which has the highest vector score *at that time and in that situation.* Multi-attribute decision-making is therefore very effective in instances in which the decision-maker has sufficient information and the attributes with which they compare options are both known, and comparable (Shoffner, 2000). In these types of decisions an error (or worse decision) is one in which the course of action chosen reflects a lesser vector score than an alternative that was available to the decision-maker at that time. Yet, while we can still identify errors in decisions that have multiple (and subjective) factors, such approaches to error, clearly, do not work in complex environments.

The issue with such research perspectives (and this is covered in greater detail in Chapter 2) is that as psychologists continued to study decision-making it become increasingly apparent that the way people made decisions "in the lab" was very different to the ways in which they made decisions in the real world. Hence Naturalistic Decision-making emerged (NDM) "to understand how people make decisions in real-world contexts that are meaningful and familiar to them" (Lipshitz, Klein, Orasanu & Salas, 2001, p. 332). The assumptions of NDM and the predominant

theories in this field are presented in detail in Chapter 2, however how NDM researchers treat "errors" is worthy of discussion here. Contrary to the lab studies cited above, NDM rejects the notion of "right" and "wrong" decisions. Instead, NDM researchers seek to understand the cognitive processes associated with decision-making "in the wild" (Gore, Banks, Millward, & Kyraikidou, 2006;). This rejection of "error" has oft been viewed as a criticism of the NDM perspective. As highlighted above, in traditional and behavioral decision theories (BDT), errors are operationalized as failures to adhere to normative models (i.e., the outcomes predicted by Expected Utility and Bayesian statistics; Lipshitz et al., 2001). Doherty (1993) on the other hand argues that naturalistic perspectives are stay "simply silent" on what constitutes an error (p. 380). Specifically, Doherty (a laboratory psychologist) levied three challenges to the naturalistic community; 1) What is an error? 2) What has naturalistic research contributed to how we understand of error? 3) Can naturalistic researchers detect errors without hindsight? In response to these challenges, Lipshitz highlighted that understanding error is one of the cornerstones of the naturalistic framework. Furthermore behavioral decision-making theories generally try to understand error as the result of faulty decision processes, NDM sees errors within their wider context (Lipshitz et al., 2001, p. 340). In fact, he challenged the traditional view of error, in that the commission of errors is not necessarily a problem and that striving for "error-free performance" may, in fact, be maladaptive. Instead, Lipshitz et al. argue that we need to think about the consequences of errors, not just the reasoning processes (p. 340).

Using the naturalistic perspective Orasanu, Martn and Davidson (1998) sought to explain the role of decision processes in negative outcomes. Crucially then, and contrary to the approaches above, the researchers sought to explore the relationship between negative outcomes and negative decision-making processes; rather than view negative outcomes as a reflection of a bad decision-making process. As argued by Orasanu "FACT: Sometimes people, even experts, make decisions that turn out badly. To what degree are these bad outcomes a function of inadequate decision-making processes?" (Orasanu et al., 1998, p. 2). In a naturalistic setting, there are two issues that preclude the study of "errors." The first is that, as seen above with BDT, errors are usually defined as a deviation from a "best" decisions. However, in naturalistic settings, the "best" decision may not well be defined in the same way it is in a laboratory. Secondly, there is a looser coupling of decisions made and outcomes. What this means is that outcomes cannot be used as an indicator of

decision-making quality. This is what Baruch Fischhoff and others have referred to as "hindsight bias;" the propensity to define errors by consequences (Fischhoff, 1975).

In Doherty's original criticism of the naturalistic paradigm, he called for a normative process for evaluating the quality of decision-making. The issue then is that, as Lipshitz argues, there is not a "normative" process from which deviations can be identified. Instead standards for identifying errors relate to errors in situation assessment, mental models, and option generation/evaluation. Not concurrent choice (Zsambok & Klein, 2014, p. 158). Orasanu and colleagues, in seeking to explain the decision-making of aviation pilots, described a decision process that involved two steps: situation assessment (SA) and course of action (CoA) selection (Orasanu et al., 1998). Situation assessment involves defining the problem (as well as an assessment of risk and time available to decide). Once the problem was defined, courses of action could be chosen based on options available. Given this then, there were two key ways a pilot could make an error. Firstly, they could misinterpret the situation (an SA error). SA errors include misdiagnosing or ignoring cues, resulting in an inaccurate picture of the problem. They could also under or overestimate the levels of risk or time available. In complex, dynamic events the decision-maker can fail to update their assessment as the situation unfolds, or they gain new information. The second type of error is that inspire of a could correct interpretation of the situation the decision-maker can choose an inappropriate course of action (a CoA error). Orasanu and her colleagues examined 37 aviation incidents in which crew behavior played caused an error (as determined by the National Transportation Safety Board). In examining these aviation errors Orasanu found that the most common error was to "continue with the original plan of action in the face of cues that suggested changing the course of action." These plan-continuation errors accounted for almost 75% of all tactical decision-making errors. What this means is that most errors stemmed from an inability to either 1: update SA, or 2: re-evaluate an already-selected CoA based on a new SA.

In exploring why these errors occurred Orasanu (in line with Gary Klein) identified three causes of decision error: i) lack of information; ii) lack of knowledge; and, iii) a failure to simulate the potential outcomes of a situation. These causes strongly aligned with the view that decision-making is "bounded." Bounded rationality, as proposed by Herbert Simon in 1957, is, simply, that the choices people make are determined by overall goals, which are then bounded by the knowledge that decision-maker does, and does not, have of the world. The final decision is therefore dictated by their ability (or inability) to obtain relevant knowledge, to calculate

consequences, develop courses of actions, and cope with uncertainty. Overall rationality is bounded because these abilities are severely limited. As Simon states, behavior in the real world is determined by the "inner environment" of people's minds (memory contents and processes) just as much as it is the "outer environment" (Simon, 2000, p. 55). In line with this recognition of the role of the environment in decision errors, Oranasu identified "error-inducing contexts" that played a role in aviation errors. Error-inducing contexts, Orasanu argues are those in which the features of the environment are likely to induce error. These contexts are ambiguity (i.e., people do not have good enough information to diagnose, identify CoAs, anticipate consequences and understand risk) and goal conflict (in which organizational and social factors do not align meaning that the decision-maker tries to meet a goal by deviating from an optimal course of action). I elaborate further on what, within the environment, can create error in Chapter 3.

Lipshitz et al. (2001, p. 339) argues that it is our treatment of errors that distinguishes NDM from BDT. Specifically, NDM researchers do not couple errors in the outcome as indicative of errors in the decision-making process. While this is not to say that errors in decision-making do not lead to errors in the outcome, the two are not ontologically dependent. Given this then as I move forward with this thesis, I will be increasingly focused on what causes deviation in the decision-making processes; specifically, how the decision-making process becomes derailed from an "optimum" decision-making process.

Conclusion

In this chapter, I defined, and then critically analyzed what I mean by "a decision". I looked at what "hard" decisions are, and specifically what makes decisions hard. Rather than focusing exclusively on the idea that high-stakes outcomes dictate decision difficulty I instead focused our attention on the problems of the choice itself (namely, task and outcome uncertainty) as common features that define hard choices. In addition to this, I outlined least-worst decisions that challenge our common conceptions of how decisions are made. In addition, and central to least-worst decisions, I looked at what "good" and "bad" decisions are, orientating our perspective to focus on decision-making processes, rather than outcomes. In my view and, as will become a consistent feature of the thesis, part of what makes decisions good is that when all options look bad; "good" meaning least-worst or most tolerable given the circumstances. Having established then that these

types of decisions are poorly explained by common multi-attribute or economic theories of decision-making, I will not look to theories (and doctrinal perspectives) that seek to explain how Soldiers make decisions in high-uncertainty, time critical situations. After outlining these perspectives (Chapter 2) I will present a model that I feel supplements NDM approaches insofar as it is a phased based model built from observations with experienced practitioners (Chapter 3). I will then seek to apply this model to the decision-making of military personnel (Chapter 4).

CHAPTER 2: MILITARY DECISION-MAKING: DOCTRINE, RATIONALITY AND FIELD BASED APPROACHES

Nine-tenths of tactics are certain, and taught in books: but the irrational tenth is like the kingfisher flashing across the pool, and that is the test of Generals.

- T. E. Lawrence

"The most extreme scenario was north of Konduz, Afghanistan. There was a village up there called Barouc and we knew the Taliban were amassing in this town and estimates were in the low thousands…So we sent in one of our Special Operations Forces (SOF) teams to get into position to get a better sense of who was in there, maybe call in some airstrikes on some of the perimeter elements that were isolated from this town to minimize the collateral damage and also just to probe to see what was going on in there to see if we could draw them out. So, we had essentially four or five guys. A couple of Americans and a few northern alliance guys driving up in close proximity a few kilometers away from what we thought was a couple thousand Taliban. Not very good odds, but they had a decent escape route and thought it was relatively clear. So, they go in, isolate a couple of areas that are confirmed Taliban, call in a couple of airstrikes; all hell breaks loose. The enemy pretty much determined where the airstrikes were being called in from and decided to attack. This team had been working a couple of fighters (planes) as they were probing these targets and essentially the next radio call is

"Oh geez, here they come,"
"How many?"
"There's a thousand to fifteen hundred, all of them coming at me"
"How far away are they?"
"Three kilometers"
"What's their speed?"

They are passing this information back and forth.

"Okay SOLAR (the Air Support Operation Centers' call sign) what have you got for me? I need something right now?"
"We got another formation of fighters"
"That's not going to cut it, I need something to take out essentially a grid."

The formation of this valley as they were coming up to the post nicely funneled all these guys coming at him. He saw this as hitting a home run, and said "I'm going to stay here and set this trap, draw them up to me." We told him we had B-52s available but it was going to take 20-30 minutes for them to get there. He said "*great*… what have you got in the meantime?" He got a couple more fighters and we did some harassment bombing. He built a bomber box, set up like a grid pattern to match this area in this valley, he did a very nice job of forming it. We put him in contact with the B-52s and they did their coordination, but as they were getting closer, from the tempo and the excitement in his voice, you could tell things were getting dicey. He said "okay I can only stay here for 10 more minutes. Oh, I'm taking some shots from some guys coming in from the side. I can only stay 5 more minutes to control this air." Then the last transmission was essentially "I don't know if I can get out of here, I think my escape route might have been cut," so his last request was "if you do not hear from me, bomb the bomber box that I gave you." The implication was "they got me, and you might as well bomb it anyway, because it is the end of the game for me." So, at this point we get the commander, explain to him the situation and tell him that this guy had requested to execute this mission even without his final control because the mere fact that we had not talked to him tells us he has probably been captured or killed. This is a very tough decision for the commander, and it is his alone to make. So, a pretty tough three or four minutes. Seemed like an eternity, as the airplane is checking in with no contact from the ground, and the last thing you hear is kind of like ricocheting and bad stuff going on. So, we are all sitting there, your stomach is getting tied up in knots, the whole tent is silent and all eyes on three of four folks staring at the radio with the

> commander making this decision. Finally, he said "alright, do it." We relayed to the B-52s, "missions' a go clearance given on our order, no final contact required." So, the mission goes. We still don't hear anything from the SOF team. Every minute that goes by we think we probably just killed our own guys. Probably ten minutes later we get a radio call "SOLAR, SOLAR, team XX, thank you, thank you. We are all fine." And that is as close as I ever want to see it again."

The above extract comes from Call's (2007) interviews with tactical air controllers in Afghanistan and Iraq. This decision epitomizes the types of choices that this thesis is interested in understanding. Both options are adverse; don't call in the airstrike and leave your officers on the ground without any support and under attack by Taliban forces. Do call in the air strikes and you will likely kill your own Soldiers. The decision-making, while it involves multiple actors, comes down to a single binary do/don't decision. The decision is *very* time-pressured (meaning you cannot procrastinate or buck-pass) and there is social, organizational, and personal accountability.

In an effort to understand current psychological theories on how decisions such as this are made, in this chapter I explore and discuss three broad approaches to understanding military decision-making: (i) the Military Decision-Making Process (MDMP), based largely on historical experience and, arguably, best described as the nearest thing to a doctrine-based approach; (ii) rational-cognitive approaches, and the literature on heuristics and biases and the means to try and optimize decision-making and (iii) so-called 'naturalistic decision-making' approaches (NDM) – based largely on observations of decision-making in the field and thus perhaps best considered as a descriptive observation-based framework. I will show how these approaches each contain strengths and weaknesses, and that each weakness reveals considerable gaps in our knowledge about the specific nature of the impossible decisions that Soldiers face. In brief, MDMP is labor-intensive, extremely difficult to enact in time-critical situations and has little empirical support – either in terms of it being observed in real settings or in terms of its efficacy. That is, it neither descriptively catches what does happen, nor prescriptively catches what *should* happen. The rational-optimal approaches are somewhat naïve about what is possible in real-world decision-making and fail to consider either expertise or the notion that calculating optimality is not always possible. This approach falls in failing to catch what people *actually* do when making decisions, even though it provides a useful prescriptive approach about what they *should* do, in the ideal.

Finally, the NDM approach is somewhat piecemeal in its application, and although powerful in helping identify how actual decisions are made, has neglected to examine concepts such as inertia, accountability, and the pitfalls that decision-makers are prone to falling into (and why). In Chapter 3, I summarize the developments that have built upon each of these approaches. The SAFE-T model (Situation Assessment, Formulate Plan, Execute Plan, Team Learning) has the benefits of phased-based models (that align with what NDM has identified as a common feature of real-world decision-making) but is far more streamlined than the MDMP. In addition, it recognizes the very real 'error spots' within and across these phases – spots that have much in common with traditional, rational approaches to decision-making that have identified how and when an error occurs. However, before describing SAFE-T, it is important that I fully explore these three strands of thinking that I have drawn on to inform its genesis.

The Military Decision-Making Process

The Military Decision-Making Process (MDMP) is the rational-methodological tool used by military personnel to solve tactical problems and make military plans. As such, it represents the Army's formal methodology for making tactical decisions (Burwell, 2001). When followed correctly it should "lead to the best (or at least a better) decision given the degree of uncertainty and complexity of the situation" (Allen & Gerras, 2009). The MDMP itself stems from the original Army process of "estimating the situation" (Michel, 1990): The first documented instance of this was Maj. Von Steuben's "estimation of the situation" produced for General Washington regarding how to attack British forces at Stony Point during the Revolutionary War (Hittle, 1975). The process of estimating the situation became formalized in a 1910 Field Service Regulation prescribing that:

> To frame a suitable field order the commander must make an estimate of the situation, culminating in a decision upon a definite plan of action. He must then actually draft or word the orders which will carry his decision into effect. An estimate of the situation involves a careful consideration from the commander's viewpoint, of all the circumstances affecting the particular problem. In making this estimate he considers his mission as set forth in the orders or instructions under

> which he is acting, or as deduced by him from his knowledge of the situation, all available information of the enemy (strength, position, movements, probable intents, etc.), conditions affecting his own command (strength, position, supporting troops, etc.) and the terrain insofar as it affects the particular military situation.

The MDMP today reflects generations of experienced officers' years of adaptation since this original doctrinal conceptualization (Michel, 1990).

The current MDMP, as detailed in ATTP 5-0.1 (2011) is an iterative planning methodology that seeks to integrate and streamline the commander, staff, subordinate headquarters, and other partners to understand the situation and mission. It requires them, as a singular unit, to develop and compare courses of action; decide on a course of action that best accomplishes the mission; and produce an operation plan or order for execution. (ATTP 5-0.1, 4-1). This version of the MDMP (as with previous versions) contains seven steps, each of which begins with certain inputs and results in certain outputs. As such, the MDMP is a linear process in which each step is sequential, building on the previous steps. The first step in the MDMP is the receipt of the mission, after which the staff prepares for mission analysis and conducts a quick initial assessment that determines (1) the time available from receipt to mission execution (2) the time needed to plan, prepare and execute the mission, (3) the intelligence preparation, (4) staff estimates available to assist planning, (5) staff experience, cohesiveness and level of rest and stress (ATTP 5-0, 4-19 – 4 - 20). The second step is mission analysis. Mission analysis allows the commander to, "gather, analyze, and synthesize information to orient themselves on the current conditions of the operational environment" (ATTP 5-0, 4-25). As such, mission analysis involves the commander and staff working to better understand the situation and the problem, identify what must be accomplished, when and where it must be accomplished, and why it needs to be accomplished (ATTP 5-0, 4-25). A key process within mission analysis is forming an initial Intelligence Preparation of the Battlefield (IPB). The IPB is a systematic and dynamic analysis of a geographically defined threat and operational environment. Mission analysis, as a process, encompasses 19 discrete steps (see ATTP 5-0, 4-31). These sub-steps within mission analysis involve analyzing the higher headquarters actions, determining constraints, identifying critical facts and assumptions, conducting risk assessment, developing the initial commander's intent and

reviewing facts and assumptions. Course of Action (CoA) analysis follows mission analysis. A CoA is a "broad potential solution to an identified problem" (ATTP 5-0, 4-79). Within CoA development, each possible CoA must meet a series of criteria. They must be suitable to accomplish the mission and comply with the commander's guidance, feasible in that the unit must have the time and resources to accomplish the mission, acceptable in that the CoA must justify the costs (including potential civilian harm) and resources available, distinguishable in that each CoA significantly differs from each other, and complete in that the CoA must represent a complete mission plan. CoA development itself is an eight-stage process that involves analyzing combat power, generating options, arraying forces, developing schemes for maneuver, assigning headquarters and preparing CoA statements, conducting CoA briefings and then selecting or modifying CoAs for continued analysis (see also FM 101-5, 5-11).

After a series of CoAs have been developed they are analyzed via wargaming. Wargaming is the examination of a battle plan in an artificial environment and identifying the likely reactions, impacts, responses, costs, and benefits of a plan (Pech & Slade, 2004). Wargaming follows a formalized 8-step process that involves several steps: gathering tools; listing friendly forces; listing assumptions; listing critical decision points and events; determining evaluation criteria; selecting the wargame method, and how to record and display results. The wargame itself follows an action-reaction-counteraction cycle until a critical event is completed, or the commander determines that the CoA is incapable of achieving the mission (FM 101-5, 5-22). General "rules" for wargaming include having participants remain objective and not allowing a sense of "what the commander wants" to influence evaluations, as well as avoiding developing premature conclusions and then gathering facts to support such conclusions (i.e., cognitively "closing" on a CoA and ignoring other options; see Kruglanski, 1989, 1990). After all identified CoAs have been wargamed, the CoAs are compared by each staff officer analyzing and evaluating the advantages and disadvantages of each CoA.

Acknowledging that military operations are often conducted in time-sensitive situations and that operations may "outrun" an initial plan, both the Field Manual 101-5 and ATTP 5-0.1 offer guidelines for conducting a time-restricted MDMP. In military planning, "time" is both nonrenewable and the most critical resource, and the MDMP is abbreviated whenever there is insufficient time for the thorough and comprehensive application of the full MDMP process. That said, within time-restricted planning, the process *itself* is not altered. As the Field Manual states,

there is only one process, and omitting steps is not the solution (FM 101-5, 5-27). There are four primary time-saving techniques when employing the MDMP in time-sensitive environments. The first is to increase the involvement of the commanding officer allowing them to make hands-on decisions during the process rather than being briefed (and then providing feedback) on the results of the process. The second technique is for the commander to be more direct in the guidance provided, limiting the number of options that can be generated. The third technique is to "cap" the number of CoAs that can be developed (minimizing the amount of wargaming, evaluations, and comparisons). Finally, parallel planning can be used. This abbreviated version of the MDMP maximizes the available use of time while also facilitating adaptability in the face of a rapidly changing situation (FM 101-5, 5- 28).

Practical and Theoretical Issues with the MDMP

The military has adhered to a model of decision-making (both doctrinally and in training) that is both rational and linear (Allen, Coates, & Woods, 2012). Crucially, it is based on experience and expertise and is thus informed by many generations of experienced commanders. As such it is in line with approaches that celebrate and recognize that decision-making is phase based, experience-led and uses previous patterns to deal with new situations. Further, the MDMP recognizes the value of scenario-based learning and the use of alternatives to test assumptions. There is no question then as to its strengths. However, there are several pragmatic concerns with the MDMP. Firstly, it is very time-intensive (see Matthews, 2013, p. 55). Specifically, it is not uncommon for commanders to invest most of their time in CoA development (Antal, 1998), as such, once a CoA has been recommended and approved there remains little time to develop a full plan that includes contingencies and follow-on actions (Shoffner, 2000). Furthermore, in time-sensitive situations the systematic MDMP process can demand more time than is afforded by the situation (Fallesen, 1993). Second, the MDMP thus rests on the assumption that the commander has good information, fully understands the battlespace, and has time to prepare, evaluate, and execute the best CoA (Matthews, 2013, p. 55). Third, contrary to multi-attribute decisions the target in military decisions is both adaptive and potentially unpredictable. An unpredictable enemy thus increases the likelihood that assumptions made in the MDMP will be false and increases the likelihood "unknowns" will be encountered in the mission execution. Dealing with an

unpredictable, adaptable opposition, along with the latent uncertainty inherent in military operations increases the "noise" introduced into the MDMP, increasing the likelihood that an outcome will be poorly matched to the real operating environment. This is especially pertinent when the outcome of the MDMP is a single CoA that is optimized to work against the most likely enemy CoA (FM 101-5, see also Shoffner, 2000).

Traditional Decision-Making

Practitioners of war and not cognitive scientists developed the MDMP (Matthews, 2013), as such there are questions regarding the degree to which MDMP doctrine reflects the decision-making strategies employed by members of the military when operating on deployment. From a theoretical standpoint, the MDMP is closely aligned with the "rational comprehensive" model of decision-making, in that it focuses on identifying alternatives and comparing them to a prescribed set of criteria (this is also referred to as "economic rationality," Simmons 1997). The MDMP is thus rooted in views that decision-making is algorithmic and idealized, in that they assume decision-making processes occur in perfect situations with significant time resources. It, therefore, shares several commonalities with what psychologists refer to as "traditional" or "classic" models of decision-making. "Traditional" theories of decision-making have been under development for over three hundred years and have their roots in economics, philosophy, and mathematics (see Doyle & Thomason, 1999). The traditional approach is therefore analytical (contrasted with *intuitive*), in that it assumes decisions are made through a process of logical (i.e., unbiased) probabilistic analysis. This approach has been characterized by several main concepts; (Funder, 1987; Gigerenzer & Todd, 1999);

1. There is a choice between multiple available alternatives.
2. Decisions are the result of a deliberate analytical process that involves a comprehensive search for information that culminates in optimal performance.
3. Models can be developed and tested quantitatively that will predict decision-making.

The issue, however, is that by the late 1960s psychologists had amassed a considerable body of evidence that documented numerous decision-making anomalies that derived from faulty

(and non-rational) reasoning (e.g., see Goldstein & Hoggarth, 1997). From this it was clear; people are not skilled 'probability estimators' who derive their judgments, in a systematic way, from mathematical calculations (as argued above). It was in the face of this realization that Tversky and Kahneman's (1973) studies made such an impact on the field of decision research. As they found, "our studies show that utility theory, under the standard interpretation, is grossly inadequate as a descriptive model of individual choice behavior" (Tversky, 1975, p.164). Instead, "people rely on a limited number of heuristic principles, which reduce the complex tasks of assessing probabilities and predicting values to simpler judgmental operations. In general, these heuristics are quite useful, but sometimes they lead to severe and systematic errors." (Tversky, 1975, p. 164)

Heuristics and Biases

Tversky and Kahneman found that we often use "heuristics" or mental shortcuts to inform our judgments. As Golstein and Gigerenzer (2002, p. 75) argue, heuristics are substitutes for computations that are otherwise too demanding for the mind to carry out. As Kelley argues, the assumption is that the "naïve psychologist" in the street uses an equally "naïve" method of science which is, logically, a poor replica of the scientific one; incomplete and subject to bias, but which can proceed on incomplete information unlike the scientific method (Kelley, 1973, p. 109). It follows that when people make estimations of probability, they are not aware of the underlying heuristics that may govern these judgments, they cannot control the use of heuristics, and, if taught about their existence, they can learn to make appropriate corrections. In their 1973 paper, Tversky and Kahneman identified several underlying heuristics that affect judgments; while many others now exist, these three are still viewed as playing a central role in probabilistic decision-making. Specifically, these heuristics can be roughly grouped into (i) assessments of representativeness or similarity, (ii) going with the answer that is most easily accessed (availability heuristic) and (iii) anchoring and adjusting. Below I unpack each of these in turn.

The representative heuristic is often evoked when we try to figure out whether an object belongs to a "class" (i.e., superordinate category) of objects. An oft-used example has us considering the following individual: Mr. X. is described as "meticulous, introverted, meek, and solemn." People are then asked to evaluate the likelihood that Mr. X is a farmer, librarian, pilot, or salesman. Because, Mr. X appears "similar" to (that is, has traits representative of) a librarian,

people often say he is most likely to be a librarian. This judgment, however, ignores the general base rates of these occupations, (i.e., there are a lot more farmers than librarians). Tversky and Kahneman found that people generally ignore base rates and sample sizes, focusing instead on the degree to which the individual is "representative" (i.e., stereotypical) of a given group. Tversky and Kahneman also identified the "availability heuristic" whereby we assess the frequency of a class (or probability of an event) by the ease with which we are able to remember a instance of that event (p. 19). The third of the heuristics originally identified by Tversky and Kahneman is anchoring. Anchoring describes how our final judgments depending upon an initial value, rather than an objective estimation (this is also a common tactic in business and salary negotiations). Hence, what Tversky and Kahneman's research introduced was the idea that, although individuals should adhere to the normative logic, they do not. Instead they make systematic, and predictable errors deriving from the use of cognitive shortcuts and biases.

Naturalistic Decision-Making

As argued by Gary Klein (2008) "by 1989, it was fairly clear how people didn't make decisions"; Decision-makers didn't "generate alternative options and compare them on the same set of evaluation dimensions. They did not generate probability and utility estimates for different courses of action and elaborate these into decision trees. Even when they did compare options, they "rarely employed systematic evaluation techniques" (see Klein, 2008, p. 456). In response to this, Naturalistic Decision-making (NDM) emerged as a distinct sub-discipline within decision-making and now has made 30 years' worth of contributions to the field. NDM models have been empirically shown to match what decision-makers do in dynamic and uncertain high-stakes situations (Cannon-Bowers & Bell, 1997; Pascual & Henderson, 1997), and NDM perspectives have been confirmed as relevant to decision-making in a range of organizational contexts including aviation, sport, business, engineering and the military (more in Chapter 3; see Gore, Flin, Stanton & Wong, 2015). NDM models have become attractive to academics and practitioners seeking to explain decision-making in time-pressured and uncertain situations due to emphases on intuition and expertise.

NDM seeks to describe how people make decisions in the real-world. An NDM researcher might conduct field research to discover the strategies people use when making tough decisions

with limited time, high uncertainty, high-stakes and unstable conditions, rather than beginning with a rational actor model in mind. As Lipshitz discusses in his seminal history of NDM; to fulfill this "mission" NDM focuses on five characteristics: proficient decision-makers, process orientation, situation-action matching decision rules, context-bound informal modeling, and empirical-based prescription. The characteristic that arguably receives the most attention is the role of proficiency. The 'proficient decision-maker' recognizes the role of prior experience in the decision-making process. As Zsambok (1997, p. 4) states NDM is the way people use *their experience* to make decisions. As such, the decision-maker is not a passive evaluator of information but uses prior experience to sort incoming details and to direct the search for new information.

Although there are many different NDM models (see Lipshitz, 1993 for an outline of numerous examples), Recognition-Primed Decision-making (RPD; see Klein, 1993; 1998) is viewed as the "prototypical" NDM model (Lipshitz et al., 2001). RPD developed serendipitously to explain research on how fire commanders made decisions under time pressure and high uncertainty (see Klein, Calderwood & Macgregor, 1989). Klein and colleagues figured that time constraints would cause commanders to generate a small number of alternatives, falling back between a favored option and an alternative, rather than engaging in the full comparison and analysis of all available courses of action. The reality was even starker: the commanders often carried out the *first* course of action they identified. RPD, therefore, emerged as a model to answer two questions: How could commanders rely on the first option they developed? and how could they evaluate this option without considering any alternatives? The key insight of RPD, developing from the idea that a decision-maker sizes up a situation and responds with the first course of action generated is that the more "expertise" an individual has the more feasible that first option will be (Klein, Orasanu, Calderwood & Zsambok, 1993). Regarding the evaluation of any course of action, the decision-maker engages in mental simulation to assess its chances of success. In situations of high uncertainty, the decision-maker will engage in "story-building" to mentally simulate what *could* happen (see Pennington & Hastie, 1993; Klein & Crandall, 1995). This model is termed *recognition-primed* to imply that decision-makers with significant prior knowledge in the area are more likely to recognize parallels between current and previous situations, and therefore to build better mental simulations of what might happen in the present situation. This cognitive approach mirrors that of chess masters; rather than laboriously planning many moves

ahead, they rely on their greater experience with board positions to make relatively accurate predictions about the strength of the moves available to them. Novices, on the other hand, will tend to try to consciously play out several moves ahead from a candidate move, wasting precious cognitive resources, and likely arriving at a worse CoA. To date, this strategy of RPD has been identified in naval officers, medics, tank platoon leaders and aviation pilots (see Klein, 1998; Klein, 2013 for reviews) in fact RPD has been integrated into the MDMP to find ways to increase reliance on intuition and expertise in military decision-making, as well as to speed up the overall military decision-making process in time-sensitive situations. This hybrid RPD-MDMP model is outlined below.

Recognition Planning Model of Military Decision-Making

In 1999, John Schmitt and Gary Klein published the results of their naturalistic study of military decision-making. Their presupposition (which I agree with and highlighted earlier) was that while the Army, Marines, and Navy have developed formal planning models to assist with the planning of military operations these models are inconsistent with the actual strategies used by decision-makers, and they actually slow down the decision-making process (p. 1). Instead, Schmitt and Klein argue that these formal models are actually ignored to speed up decision-making. Schmitt and Klein, therefore, proposed a new model for military operations planning, the Recognition Planning Model (RPM). The RPM they argued is consistent with both military planning methods (MDMP) and what we know about human decision-making processes in time-pressured uncertain environments (RPD; Klein, 1998; Schmitt, 1994; Schmitt & Klein, 1996, 1999a, 1999b). The RPM is both descriptive (in that it is the process that Schmitt and Klein observed planners gravitating towards) and prescriptive in that it provides a routine which could be followed to increase the pace of the planning process (Schmitt & Klein, 1999b).

The first goal of the RPM was to streamline the planning process. "Tempo" is the speed of military action and along with surprise, concentration, and audacity is a fundamental concept of maintaining the initiative in war (FM 5-71-2). The importance of operational "tempo" cannot be underestimated. The Joint Vision 2020, which outlined the U.S. vision for future capability and warfare, specifically states that "faster operations tempos" are the desired capability that will "serve as a catalyst for changes in doctrine, organization, and training." (p. 75). As I mentioned

above the MDMP can often "overrun", decreasing operational tempo and opportunities to maintain (or seize) initiative. Given this, RPM was specifically designed to be compatible with time-constrained planning situations. Secondly, RPM seeks to ensure that the commander (the most experienced person in the planning unit) is as involved as possible, rather than a more passive role of approving/disapproving options generated and presented by subordinates. Additionally, RPM does not prescribe a linear planning process. Planning, while often sequential, is also dynamic in that activities overlap (especially in large plans) and can move between phases based on feedback. Finally, in line with what Klein observed in firefighters, the RPM seeks making "a tentative decision" early in the process (rather than as an emergent outcome of the process). This will allow stages of rehearsal, order dissemination etc., to be planned prior to final approval, increasing time for the implementation stage of the operation. Based on these goals -- and coupled with their naturalistic observation of mission planning from Commander Joint Task Forces, U.S. Marine Expeditionary Forces and U.S. Marines Regiment Combat Operations Centers (among others; see Klein, 1996; Klein, Phillips, Klinger, & McCloskey 1998; Miller, Zsambok, & Klein, 1997) -- Schmitt and Klein proposed a four-stage model of military planning.

As outlined by Schmitt and Klein (1999b), the first stage of the RPM is to identify the mission and conceptualize a CoA. Contrary to the view (and MDMP) the RPM acknowledges that planners simultaneously identify the mission and conceptualize rough CoAs at the same time. This is, in fact, beneficial for the decision-maker because conceptualizing a CoA also helps to clarify the mission, because planners gain a better understanding of the problem by working through potential solutions (p. 5). The RPM also puts far less weight on identifying and comparing CoAs based on the findings (as outlined above) that decision-makers do not compare multiple courses of action in parallel, but instead accept and reject courses of action in sequence until they find one they think will work (a la RPD). As Schmitt and Klein (1999b) argue creating multiple CoAs is artificial and doesn't improve the quality of a plan (p. 7). The outcome of this stage of the RPM is to "identify" a decision – namely a tentative concept of operations. This early decision is important because it increases operational tempo while increasing the amount of time that can be taken to arrange certain aspects (for example mobilizing air support). In Schmitt and Klein's view; "a good concept well-executed is superior to a superior concept poorly executed" (p. 52) which is clearly a nod to George S. Patton's adage that "A good plan violently executed now is better than a perfect plan executed next week."

The second stage of the RPM is to analyze and operationalize a CoA. Planners cannot conceptualize a reasonable CoA without knowing if it is feasible or how it will be executed. This is, therefore, the point at which a CoA meets reality, and doing so early is critical. For example, if a central requirement of a CoA is support from allied forces then it is better to check they are willing and able as soon as possible. After it has been confirmed that a CoA is indeed "feasible", it is wargamed (like the MDMP). Klein and Crandall (1995), along with many others (such as Kahneman & Tversky, 1982; Klein, 1993), argue that mentally simulating the outcomes of an action is vital for effective decision-making. While the traditional MDMP involved wargaming all possible CoA (as a part of the evaluation of feasibility) the RPM envisions wargaming a single CoA against several enemy CoAs. What this means is that more time can be invested in anticipating how to deal with the consequences of a CoA, rather than just the implementation of a CoA. This focus on predicting the enemy's reaction to a CoA is especially important given that, as argued by military strategist Helmuth von Moltke, "You will usually find that the enemy has three courses open to him, and of these, he will adopt the fourth." Finally, once the CoA has been wargamed, approved, and become a plan the necessary order documents are developed (although usually, this will have started far earlier in the process).

In comparison to doctrinal approaches such as the MDMP, the RPM offers several advantages. First and foremost, while it is sequential, it is not linear, meaning that stages can overlap and co-occur. This means that the final stage of the RPM (order generation) has likely been ongoing since the end of stage one. Furthermore, the feasibility of a CoA is assessed much earlier, meaning that time and energy is not invested in making a decision that is not a viable option. The importance of this cannot be understated. Consider the following decision faced by General Petraeus while he was commander of the International Security Assistance Force (ISAF) and Commander, U.S. Forces Afghanistan (USFOR-A; reported in Atkinson, 2005);

> One seemingly trivial item on Sinclair's agenda was in fact vital: Should helicopter blades be taped or painted? Apache and Blackhawk rotors revolve at such high speeds—1,456 feet per second at the tips—that blowing grit could bore through the titanium spar on the leading edge of each blade. Wormlike, a grain of sand would then eat out the honeycombed material inside the blade, which might unbalance the helicopter aerodynamically and cause a crash. Traditionally, the blade edges were

> protected with strips of black tape, which had to be reapplied after every mission or two. But taping was time-consuming, difficult in the desert, and required adhesive that wore badly in hot weather. Some aviation experts insisted a thick coat of black paint, reapplied to the edges after every flight, was an effective substitute. Rotor blades were in short supply – the 101st had only five spare Blackhawk blades, which cost $80,000 each. More to the point, each Apache cost $20 million, and each Blackhawk carried the souls of four crewmen and as many as sixteen passengers. The tape-versus-paint conundrum neatly illuminated the thousand technical challenges facing every commander.
>
> This issue had been hotly debated between the commanders for months, with some aviators stating "I'll go to my grave before I put tape on." General Petraeus remained torn, he had heard some good things about tape but in his gut, he remembered the problems tape had caused in the past. The issue, however, was moot. Hardly a single roll of tape for the 101st could be found in Kuwait. The division's supply had been stored in an East Coast warehouse that had collapsed during a recent blizzard. All that discussion…. And there's no tape. (p. 54–57)

This example shows a clear strength of the RPM; The quicker you can begin to operationalize a CoA the quicker you can find out if it is feasible. In RPM, these tests of feasibility are done much sooner, increasing operational tempo and lowering the risk that resources and time will be invested in an unrealistic CoA.

Can the RPM Replace the MDMP?

The RPM has been experimented with by several military commands including the United States Marine Corps and the British Military (Pascual, Blendell, Molloy, Catchpole & Henderson, 2001). In addition, Thunholm (2007), a psychologist with the Swedish Defense University, compared division-level planning groups within the Swedish Army that used either the doctrinal MDMP or the RPM, finding that RPM increased operations tempo by 20 percent. Because the RPM did not seek to replace the MDMP, but merely codify the decision-making process it was

well received, with military personnel commenting that they were "already doing this" (Ross, Klein, Thunholm, Scmitt & Baxter, 2004). In a further test of the RPM, Ross and colleagues tested the RPM during a two-week experiment at the Fort Leavenworth Battle Command Battle Laboratory (BCBL). Here the BCBL devoted two days to training staff on the RPM. During the experimental phase, there were five days devoted to testing the RPM in action. The scenarios used involved multiple planning loops and variations of offensive operations the staff also had to plan stability and support operations after the offensive action was over. The decision-making of the teams was observed by researchers, who took questionnaires and in-depth interviews. Interestingly, the results were mixed. Participants had little trouble learning and using the RPM (unsurprising as it is designed to reflect what they were already doing) and overall, they estimated that it took 30 percent less time than the MDMP. However, there were also some concerns. Some of the participants, for example, stated that the RPM caused them to rush through the mission analysis (which in RPM occurs in tandem with CoA analysis). Furthermore, despite being instructed to use the RPM, participants were observed to gravitate towards several MDMP tools (such as listing the assumptions they were making). Overall, one participant (a Colonel) cautioned throwing away 26 years of the MDMP because of five days with the RPM. While he felt that the RPM had demonstrated sufficient face validity to warrant additional research, this demonstration alone was not sufficient to justify replacing the MDMP (Ross et al., 2004, p. 10).

There is one more important flaw in RPM that was raised by participants, and that is the degree to which the RPM helped them make decisions in novel environments. Clearly, if a commander lacks experience (central to the RPM) then s/he will generate lower-quality plans when using the RPM. This is a valid concern given that a central objective of the RPM is to let the commanders' experience increasingly drive the planning process. However, this criticism is not unique to RPM; it also affects the MDMP. In fact, new situations are generally a significant issue with the RPD (or any naturalistic) approach. Let us for a minute examine the original model of RPD (Klein, 1998; see Figure 1.).

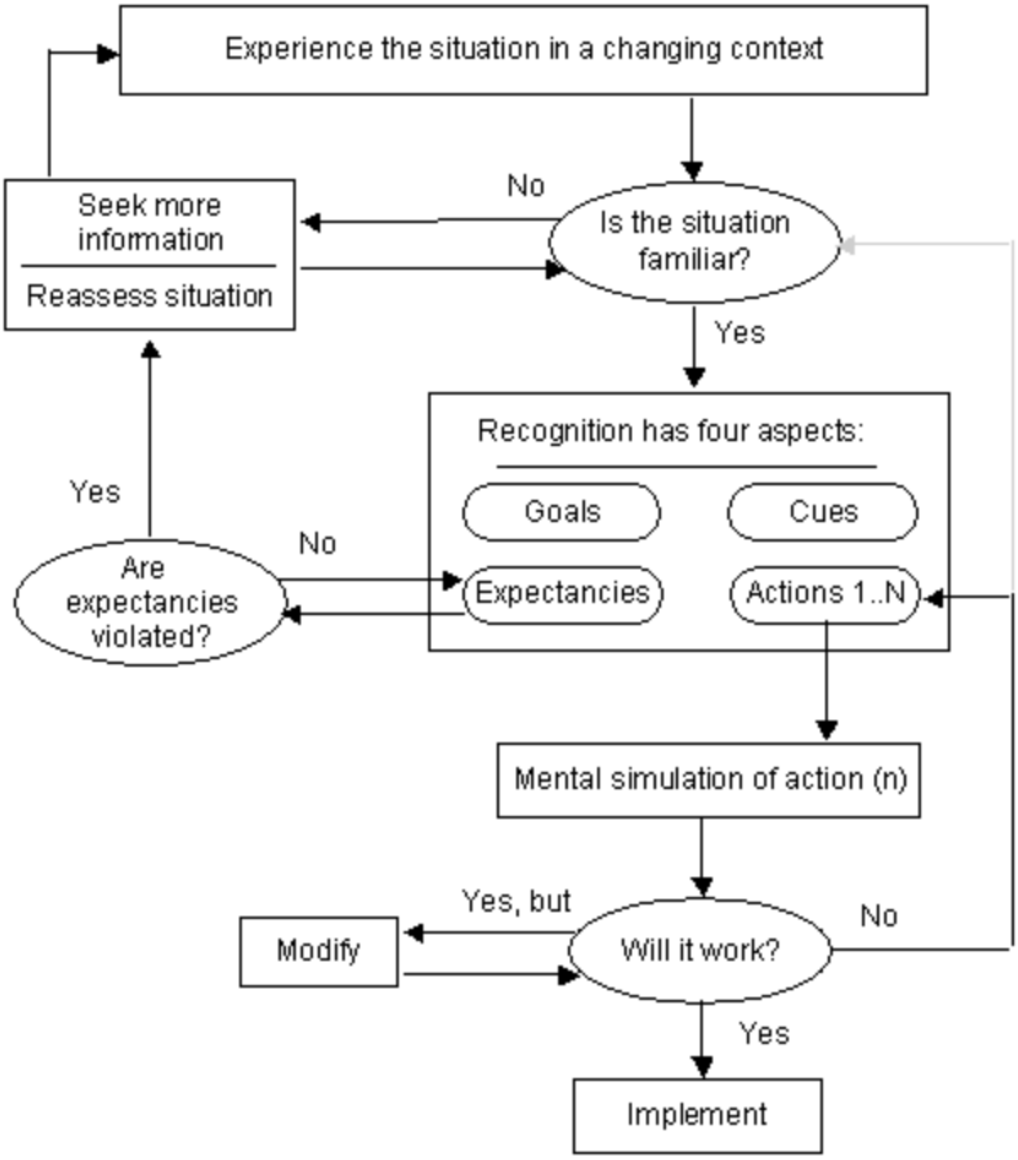

Figure 1: A Model of Recognition Primed Decision-Making (from Klein, 1998).

RPD allows fast decision-making through matching patterns in the situation to previous instances and applying previous successful actions to this situation. The pertinent question then is what happens when a situation does not match a previous one? Per Klein's RPD we engage in a further search for information, but extensive information searches are not always possible because

we lack both time and information. Consider, for example, you are facing a new situation. Following RPD, you evaluate the similarity of this situation with a series of past situations. If nothing similar comes to mind you re-evaluate. If this re-evaluation fails, according to Figure 1, you re-evaluate. Logically in fact, if this situation truly is unique, the decision-maker becomes stuck in a pattern of assessment and re-assessment. Re-evaluating the paradox of Buridan's ass (outlined in from Chapter 1) perhaps the Donkey is not paralyzed by choice, but continually re-evaluating the bales of hay in hopes of finding an analogy that suits.

This is a critical point. I do not reject the presuppositions of RPD, nor its relevance as a theory to explain how people make fast and effective decisions under conditions of risk and uncertainty. It has been empirically proven that it *is* the dominant decision-making strategy in many fields (military, police, nursing, firefighting; see Klein, 2011). However, if you look closer at the types of decisions that people have made when they use RPD they are (to varying degrees) familiar. For example, in the military cases, RPD is often shown to be a dominant strategy the planners are dealing with common well-rehearsed missions. Thunholm's research, for example, involved defending the troops from an enemy ambush (Thunholm, 2007). A Military operation "101" if you will. But, even though these types of decisions may make up most military decisions, this does not mean that we should not focus on how people make decisions in novel (albeit rare) situations. Especially, and echoing Taleb's economic theories of "black swans" (i.e., highly improbable, but incredibly damaging situations such as the stock market crash of 2008; Taleb, 2008; see also Posner, 2010)[2], because these types of situations could be those that have the highest risk of a negative outcome.

This is an irrefutable issue. RPD relies heavily on the experience of a leader or commander, specifically as it pertains to their ability to pattern match the current situation to a familiar one (Klein, 1997), but the diversity and complexity of the contemporary conflict environment, such as increased involvement in Operations Other Than War (OOTW; Taw, 2002), increases the likelihood that a commander (or a more junior officer) will face situations that they have no

[2] Now it is important here that we define what we mean by "rare". The Oxford English Dictionary defines "rare" as "of an event, situation, or condition not occurring very often". In the medical field, when talking about prevalence, scientists have defined rare as "an estimated incidence of fewer than 1:250,000 persons." (see Raghuveer, Garg & Graf, 2006 for example). Here, we adopt a view not dissimilar to that of the medial field, in that the decisions we define as rare are those that are unlikely to have been experienced by that individual before (and it is safe to assume that they, themselves, have probably made over 250,000 decisions) and is unlikely to be experienced, in the exact same way, by another soldier (and in most wars there are over 250,000 Soldiers operating in a theatre of conflict).

"analogous" experience. So, in such circumstances how do decision-makers adapt and improvise? And, what degree (if any) of transferability of expertise is there from one type of military domain to another?

This is one of the reasons least-worst decisions are so hard to make and they fall in a gap that RPD cannot satisfactorily explain. Furthermore, they check all the boxes for what we would view as a "hard" decision precisely because they are new. As highlighted by Yates (2003), decisions are hard when we cannot forecast what is likely to happen; without experience of making a similar decision in the past, it is even harder to forecast the potential outcomes of an event. This is then especially hard given that, in a military environment, operations often have second- and third-order effects as well as larger operational and strategic consequences that can be very hard to see while making decisions on the ground. Another great example of this type of decision is the rotor-blade decision faced by General Petraeus (outlined above). Rotor blade protection may be prosaic and unlikely to be something that was taught in training or experienced in a previous deployment (perhaps if it was it would not have been such a hard decision to make). Yet what is important about this decision — and what makes it so hard — is that it was novel and there was no guiding experience to reach for, in fact even those with experience still differed in their advice of what to do. These are the types of decisions I concern ourselves with for the rest of this thesis.

So, to bring these two models (RPD and MDMP) into perspective, the current Doctrine, while organizationally useful, attempts to force decision makers to make decisions in a way that is slow, unresponsive, laborious and quite opposite to the natural tendencies of cognitively limited humans. But the RPD is, perhaps, too much the other way, focusing on the quickest (and simplest) possible cognition of finding an analogy that works. This creates a critical gap in understanding (and support) when there is no analogy and a choice is required. It is here then, in addressing those situations in which analogies do not exist, and soldiers do not have the wits or time to maximize, that we begin to explore the psychology of choice.

Conclusion

In this chapter, I sketched out the history of decision-making. I outlined the theoretical perspectives both old (traditional decision-making) and new (naturalistic decision-making). Furthermore, I outlined the doctrinal perspectives that are currently used to train decision-makers

in military environments. However, as I outlined here (and has been argued by many others, e.g., Klein, 1989), these *idealistic* rational models of decision-making (such as those forwarded by the MDMP) often do not reflect the decision-making processes of those in the military who, instead, often engage in recognition-primed models in which they focus on the workability of one course of action. That said, and as highlighted above, despite the prevalence of RPD in military personnel, it alone cannot account for many types of decisions faced by military personnel; for example, those decisions in which there are multiple different actors with competing goals or those situations in which the decision-makers have no prior experience (hence they cannot use recognition-prime as a tactic). Such decisions reflect a qualitatively different process of decision-making that perhaps require an alternate (yet equally non-economic) model of decision-making. Given this then, in the next chapter, I outline a model of decision-making that I feel best accounts for these types of decisions (specifically least-worst decisions). Taking the lessons from this chapter, I focus on naturalistic (rather than lab-based) theories of decision-making. But, borrowing from the strengths of the MDMP and RPM, I present a phase-based model. However, what this model adds is a wider focus on the factors (beyond "analogies") that are at play when people make novel least-worst decisions. Furthermore, the model we present is specifically attuned to indecision, a common outcome when people are forced to choose between least-worst options (Alison et al., 2015). While I discussed delays in decision-making as an outcome of cognitive conflict in Chapter 1, using the model of decision-making presented in the next chapter I further elucidate the psychological causes and behavioral consequences of decisional conflict; namely decision inertia.

CHAPTER 3: THE SCIENCE OF SELECTING LEAST-WORST OPTIONS

In a situation where the consequences of wrong decisions are so awesome, where a single bit of irrationality can set a whole train of traumatic events in motion, I do not think that we can be satisfied with the assurance that 'most people behave rationally most of the time'

- C. E. Osgood.

Military decisions are made in unique, high-stakes, high-pressure, life or death environments. By this uniqueness, the military environment forces theories of decision-making to contort well past their structural norms, laying bare the strain in their foundations. As we mentioned above, the two models (RPD and MDMP) that have currently been applied to military decisions both have their flaws, and while both have their strengths, neither is fully fit for purpose; Doctrinal efforts constrain natural processes and elongate decision-making, while naturalistic (RPD) perspectives are too linear and only work with those decisions we have faced before. Furthermore, and as we will elaborate upon throughout this chapter, neither considers factors outside the decision-itself. What we mean by this is that often the process of making (and not making) decisions is affected by wider environmental, organizational, and social factors that alter our evaluation of options. None of these influence (despite being shown elsewhere) are conceptualized in the models used to date.

Given this, it is my presupposition (following on from those before me; Power, 2016; van den Heuvel et al., 2012, 2013; Waring, 2011) that the SAFE-T model of decision-making offers an innovative insight-generating platform through which the process of making military decisions can come into better focus. There are several, more specific benefits to applying the SAFE-T model to military decision-making. First, the SAFE-T model, as a phase model, not only identifies factors that influence the decision-making process, but also unique ways with which these factors affect the process of decision-making depending on the stage of decision-making at that time. Secondly, the SAFE-T model is principally focused on the ways in which decision-making can become "derailed". As such, it not only identifies how exogenous (factors that arise from those responsible for managing and responding to a situation) and endogenous factors (situationally specific factors

such as uncertainty and time pressure) in the environment affect the decision-making process, but how the effect of such factors are moderated by the stage of decision-making the individual is in. The SAFE-T model incorporates both the effect of exogenous and endogenous factors on decision-making. What this means is that it extends our study of decision-making of merely the nature of the choices on offer and the experiences and intuitions of the decision-maker but towards a view of the decision-maker of operating within an "ecological niche" that affects their decision-making.

The SAFE-T model is closely aligned with the issue of "indecision" (or "doing nothing", see Anderson, 2003). What the SAFE-T model adds then is that it identifies how derailment can occur throughout the decision-making process; namely decision avoidance (postponing any attempt to decide), decision inertia (being unable to decide upon a CoA) and implementation failure (failing to put a decided upon CoA into action). In this chapter, I outline the SAFE-T model and the factors that can affect and derail the decision-making process. Furthermore, I outline, from a practical and theoretical standpoint, how the SAFE-T model as applied to military decision-making earns its place by providing a series of testable hypotheses that can guide future experimental research on military decision-making (a long-standing criticism of the RPD perspective; see Vowell, 2004). Furthermore, when outlining the SAFE-T model I explore the psychological phenomena of failing to decide because it is in accommodating for indecision that the SAFE-T model can better capture the complexities of decision-making in high-consequence situations.

The SAFE-T Model of Strategically Challenging Decisions

Van den Heuvel and colleagues (2012) developed the SAFE-T model of decision-making from both the evaluation of strategic decision-making literature and a detailed naturalistic observation of decision-making in critical incidents (see Alison et al., 2013). The model was also generated with reference to several latent phase-based decision-making models (e.g., Lipshitz & Bar-Ilan 1996; Orasanu, Martin & Davidson 2001; Salas, Rosen, Burke, Goodwin & Fiore 2006; Thunholm, 2005). The SAFE-T model holds that four key phrases facilitate the accurate assessments of the situation, action, and concurrent learning. These phases are Situational Assessment (SA); Plan Formulation (F); Plan Execution (E) and Team Learning (T). Situational awareness (SA) is the process through which an individual comes to understand their environment

by identifying and encoding salient cues present within it. This allows them to draw an understanding of the environment, as well as develop expectations about what might occur (Klein 1993). Situational awareness is a central tenet of NDM in that RPD is "essentially a matter of using accurate situational awareness and assessment to intuitively choose a plausible course of action" (Brennan 2011, p. 180). Situation awareness (SA) most simply is "knowing what is going on around you" (Endsley, 2000, p.3), and "sense-making" is a central part of this process. Sense-making is a motivated effort to understand connections to anticipate future trajectories and act effectively (Klein, Moon & Hoffman, 2006). Sense-making involves sifting through large volumes of information and selecting the necessary pieces (Ben-Shalom, Klar & Benbenisty, 2012). Humans are guided by the cognitive edict to make sense of what is happening in their immediate environment. Sense-making is one of the fundamental roles of perception and cognition and when it fails the motivation to act can unravel, leaving the individual in a state of "limbo." This need to "make sense" of our surroundings (and the negative effects of not achieving this) cannot be underestimated. Recently, Chater and Loewenstein (2016) argued that sense-making is a powerful human motive, positing "the existence of a 'drive for sense-making' which, I argue, is analogous to better known drives such as hunger, thirst and sex." (p. 137). Innate drives are self- and species-preserving. They are biologically determined in that they impose "on every civilization and on all individuals in it the carrying out of such bodily functions as breathing, sleep, rest, nutrition, excretion, and reproduction" (Malinowski, 1944. p. 7.51). Innate drives are usually accompanied by powerful positive or negative affective states that cause individuals to approach or avoid stimuli and situations; being full is pleasant, whereas going hungry is not. These affective states provide the motivation to act. We do not need psychologists to tell us that uncertainty, the outcome of unsuccessful sense-making, is unpleasant (Shaw & Thomas, 2013). Hence, we can conclude that humans have a motivation to "makes sense" of their environment, that making sense of their environment is a pleasant experience, and that not making sense of their environment is an unpleasant experience which motivates the individual to undertake actions to remedy this (i.e., to gain a better sense of what is going on).

There are many definitions of SA, most of which are closely linked to aviation, but a generalist definition couches SA as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future" (Endsley, 1988, p. 82). Endsley (1995) proposed a descriptive model of the SA

phenomenon. Her theory of SA sought to "explain dynamic goal selection, attention to appropriate critical cues, expectancies regarding future states of the situation, and the tie between situation awareness and typical actions" (p.34). Endsley (1993) proposed that the first step of achieving SA is to perceive "the status, attributes, and dynamics of relevant elements in the environment." (p.36). This entails getting the best information possible on the relevant attributes of the environment. For example, a golfer would want to know the distance they are from the pin, the wind conditions (and if this will change), the shape and slope of the green. A tactical commander, on the other hand, needs accurate data on the location, type, number, capabilities, and dynamics of any potential enemy forces within a given area. The second stage of developing SA is to comprehend the situation. Comprehending the situation is based upon synthesizing the elements collected in Level 1. As such, in line with Gestalt principles, Level 2 SA "goes beyond simply being aware of the elements that are present to include an understanding of the significance of those elements in light of pertinent operator goals." (Endsley, 1995, p. 37). To unpack this, the decision-maker forms a holistic picture of the environment. This is the sense-making component of SA. The final level of SA is the "ability to project the future actions of the elements in the environment, at least in the very near term" (Endsley, 1993, p. 37). Endsley's model is viewed as the most extensive and highly cited model of SA (Golightly, Wilson, Lowe, & Sharples, 2010) and has immediate applicability when looking at the way in which members of the Armed Forces are continually required to encode the elements of a situation, understand their interrelation, and use this to predict whether they need to take (potentially life-saving) action.

Plan Formulation (PF) describes how individuals, or teams, construct possible courses of action that could be taken within a situation to achieve their goal. Thus, they match their SA to a series of possible actions strategies (Thunholm, 2005). Plan execution (PE) then relates to the point at which a decision has been made and these plans are then implemented. In multi-phased decisions, the decision-maker also can implement a decision, learn from the outcome, and self-correct before launching a new decision (Salas et al., 2006). In such cases, the decision-maker can continually reflect on and revise assessments allowing them to adapt future responses to fit the demands of a dynamic and volatile situation (Team learning; T).

Decision Inertia

Research on decision-making has increasingly turned its focus to the psychological phenomenon of indecision. "Decision inertia," is one specific form of indecision in which the decision-maker engages in "redundant cognitive deliberation of choice for no positive gain" (Alison, Power, van den Heuvel, Humann, Palasinksi & Crego, 2015). Decision inertia, therefore occurs between the 'option generation' and 'option evaluation' stage of decision-making and involves an active, engaged, effort to decide (contrary to decision avoidance; the passive avoidance of a decision that needs to be made). Decision-makers are more likely to become inert when they are faced with decisions that are "least-worst," i.e., those in which all choices offer a potential negative outcome and are high-risk and naturalistic research on members of the police, fire and ambulance services has shown that, when faced with a least-worst decision, decision-makers struggle to decide (Power & Alison, 2017; van den Heuvel et al., 2012).

After conducting a Critical Interpretative Synthesis (Dixon-Woods et al., 2006) of literature on decision-making and indecision Power (2016) developed a taxonomy of decision inertia arguing that it can take three forms; decision avoidance, decision inertia, and implementation failure. Contrary to decision avoidance (outlined by Anderson, 2003) decision inertia is defined as "the redundant cognitive deliberation of choice for no positive gain" (see Alison, et al., 2015). Thus, what separates decision inertia (a negative outcome) from more general indecision or avoidance (which can be positive when it prevents hasty or reckless decisions; Janis & Mann, 1977; Kahneman & Lovallo, 1994) is that despite the individual's motivation to act, they struggle to commit to a choice (either cognitively, or behaviorally). A central facet of decision inertia, therefore, is that the decision-maker fails to decide within a "ideal" timeframe. With that in mind then, decision inertia is immediately more pertinent to decisions in time-sensitive situations (e.g., economic, critical incident, foreign policy, or military) than more day-to-day decisions that could be deferred without causing a significant loss, or causing significant harm to life. This also separates decision inertia from the concept of hypervigilance proposed by Janis and Mann (1977) because while hypervigilance involves poor decision-making due to the perception of insufficient time, decision inertia involves the inability to decide at all within a given timeframe. In her taxonomy, decision avoidance is similar to Anderson's (2003) conceptualization (ignoring the decision and accepting the status quo).

Implementation failure, on the other hand, is distinct from both avoidance and inertia in that it is a behavioral manifestation of indecision. Specifically, it describes the situation in which an individual has committed to an action yet fails to actualize this choice (i.e., taking the necessary steps to implement the choice; see Power, 2016). Implementation failure therefore represents a psychological commitment to action (unlike inertia and avoidance) without the corresponding behavioral commitment. Implementation failure may be especially likely in situations in which the decision-maker has agonized over the choice for a long time, and there is no immediate time pressure. For example, autobiographies of members of extremist organizations often highlight that after a prolonged period of "disillusionment" with the movement they come to the decision that they must leave, however, for a host of social and personal reasons (e.g., fear of arrest, fear of retaliation, lack of social support, lack of alternatives) they are physically unable to leave (see Altier, Horgan & Thoroughgood 2013). The same may also be true for those who have committed to leaving a marriage, yet failed to take the concrete steps required to implement this choice (e.g., filing for divorce, see Janis and Mann 1977). For example, and referencing the bomb paradigm from Chapter 1, I can decide that cutting the red wire is the best course of action, but deciding which wire to cut does not cut the wire. A behavior process must be engaged to complete the decision. As Feldman and Spratt (1998, p. *i*) highlight in the introduction to their text on business mergers and acquisitions;

> Five frogs are sitting on a log. Four decide to jump off. How many are left?
> Answer: five.
> Why? Because there's a difference between deciding and doing.

In aligning Power's taxonomy with the SAFE-T model (and they are closely aligned given that Power heralds from the same school of thought as those who proposed the SAFE-T model), there are therefore three separate stages at which decisions can become derailed (later in this chapter this is visually depicted in Figures 2 and 3); after SA (avoidance), after PF (inertia) and after PE (implementation failure). Furthermore, and as identified by the SAFE-T model, inertia does not occur in a vacuum, nor as just the outcome of the nature of the options available. Instead, the SAFE-T model holds that during critical incidents there are a host of ambient, affective, cognitive and organizational factors that derail a decision-makers' ability to follow through this

sequential set of steps. Thus, what the SAFE-T model does so well (and what is completely ignored by both MDMP and RPD) is that it identifies those factors outside of the decision and the decision-maker that can equally impact upon the decision. I outline these factors below, identifying, where possible, the specific relevance of these factors to the environment within which military decisions are made.

Factors that Affect our Ability to make Strategically Challenging Decisions

Within the SAFE-T model, there are a series of situational factors that impede upon the ability, or motivation, of the decision-maker to make effective (and prompt) choices. The SAFE-T model identifies several ambient, affective, cognitive, and organizational factors that can stall, or derail, decision-making at both the situational assessment, plan formulation, and plan execution stage of decision-making. Each of these factors and their effect on the decision-making process are outlined below.

Anticipatory regret. Anticipatory regret involves forecasting the level of regret that could be experienced in the future based on decisions, or actions, that could be taken in the present (Wong & Kwong 2007). The greater the discrepancy between the current state and the (intended) outcome state the greater the intensity of anticipatory regret (Zeelenberg & Pieters 2007). While a degree of anticipatory regret can be beneficial, preventing a decision-maker from seizing a seemingly attractive option without forethought of the consequences (e.g., anticipatory regret can have life-saving consequences for individuals contemplating suicide), anticipatory regret can cause the maladaptive response of indecision, in which the decision-maker is in a prolonged SA, PF or PE phase because of a preoccupation with negative consequences (see Janis, 1985). Anticipatory regret is more likely to be experienced by the decision-maker when they are aware of the "opportunity costs" of choosing the most attractive option, when loses are imminent, when there is a degree of social commitment, when they are optimistic that a better solution could be found (in time) and when they are not under a significant time pressure (Janis & Mann, 1977). When experiencing anticipatory regret decision-makers may prefer lower risk (yet strategically or tactically less effective) options ("better safe than sorry") or more risky options ("better risky than regretful," see Inman & Zeelenberg, 1998; Zeelenberg, 1999; Zeelenberg & Beattie, 1997; Zeelenberg, van den Bos, van Dijk, & Pieters, 2002). Anticipatory regret is also closely linked

with decision avoidance with decision-makers selecting courses of action that maintain (as best as possible) the status quo, minimizing anticipated regret but potentially resulting in inappropriate action or no action at all (Anderson, 2003).

Outcome mutability. The likelihood that an individual will experience anticipatory regret is closely linked to outcome mutability. Mutability is the ability to reverse the outcome of a decision or event (Morris & Moore, 2000). In highly mutable events decision-makers are viewed as more accountable because the decision-maker is viewed to have been able to prevent it (see Coombs & Holladay, 2002). In decision-making mutability is strongly linked to the "lost opportunity" hypothesis (see Beike, Markman, & Karadogan, 2009) in that decision-makers may avoid launching interventions that offer a low chance of being "fixed" if the outcome was regrettable because doing so will lose them opportunities that could have been available to them if they had taken an alternate (or no) action. Thus, highly immutable situations encourage indecision because of anticipatory regret regarding potential opportunities that could be lost due to irreversible decisions.

Accountability. Accountability is comprised of four main factors, each of which has been found to influence decision-making. These factors include being appraised by external audiences (Klehe, Anderson, & Hoefnagels, 2007); who have the power to instigate rewards or punishments (Baucus & Beck-Dudley, 2005); when the individual knows that any actions will be linked back to oneself (Postmes & Lea, 2000); and that they will be required to provide a justification or explanation for these actions (de Kwaadsteniet, van Dijk, Wit, De Cremer, & Rooij, 2007). In decision-making, the expectation of future accountability can influence behavior (Frink & Klimoski 2004). When looking at the SA phase of decision-making the anticipation of future accountability can affect the information gathering and interpretation processes, it can also encourage a decision-maker to consider more (potentially useless) information without first discerning its relevance, increasing cognitive load (Tetlock & Boettger, 1989). In the PF and PE phases of decision-making, accountability encourages a decision-maker to switch towards egocentric, defensive, justifications for formulated plans and executed actions (Gollwitzer & Moskowitz 1996). Specifically, in naturalistic research on decision-making of police officers facing a dynamic terrorist event, feelings of accountability resulted in shifting priorities away from saving the lives of those who could be victims of a (potential) terrorist attack to saving oneself (i.e., making decisions that could be defended if reviewed later and after the fact; van den Heuvel

et al. 2012). Like anticipated regret, accountability is also linked to inaction. Alison (2010) found that police officers viewed "non-decisions" (i.e., doing nothing) as less blameworthy than taking an action that may result in a negative outcome. Increased accountability, therefore, increases self-preservation, and detracts attention away from the task at hand, inhibiting the ability of the decision-maker to discriminate between critically relevant and irrelevant information (Waring, Alison, Cunningham & Whitfield, 2013).

Uncertainty. Finally, within the SAFE-T model (as with the larger literature on NDM), uncertainty has a clear negative impact on decision-making. The effect of uncertainty and ambiguity on decision-making has been studied extensively in the literature (Kahneman, Slovic & Tversky, 1982; Lipshitz & Strauss, 1997). While uncertainty has many varied definitions (see Argote, 1982) it can generally be viewed as a lack of precise knowledge about the likelihood of events (Hogarth, 1987). Thus, uncertainty is a subjective experience that results from trying to make decisions in situations that involve missing, complex or conflicting information (Klein, 1998).

In a laboratory environment, often involving simple scenarios and calculations, outcomes are known. I know, for example, that if I give this individual 50% of my money as a reward for their performance, I will keep 50%. "Real" decisions, on the other hand diverge, because the real world is filled with uncertainty. As such, how we deal with uncertainty has always been prominent in the literature on decision-making (Kahneman, Slovic, & Tversky, 1982; March & Olsen, 1976). In the traditional lab studies outlined above, gains were absolute, derived from the monetary value of an outcome with a known level of risk between two options. Yet in the real world, the differentials between options (and especially outcomes) are not so clear, and decision-makers will struggle to determine what has happened; what is happening; and crucially, what will happen if they act (or do not act). Uncertainty has had an uncertain history: As Yates and Stone (1992, p. 1) argued, "if we were to read 10 different articles or books about risk, we should not be surprised to see risk described in 10 different ways." A consensus definition now is "Uncertainty in the context of action is a sense of doubt that blocks or delays action", Lipshitz and Strauss (1997; p. 150). As mentioned above understanding how decision-makers make decisions under circumstances of uncertainty is a central tenet of NDM and NDM researchers have identified a series of strategies (e.g., Lipshitz & Strauss, 1997) that are employed to reduce uncertainty during the decision-making process. Lipshitz and Strauss, for example, proposed the R.A.W.F.S. heuristic that

collectively refers to the five different methods through which a decision-maker navigates uncertainty: (1) Reducing uncertainty (by collecting more information), (2) making Assumptions, (3) Weighing pros and cons of alternatives, (4) Forestalling, and (5) Suppressing anxiety (Lipshitz, 1997; Lipshitz & Strauss, 1997). These five methods are deployed preferentially in the order displayed above: Inadequate understanding is reduced by collecting (or attempting to collect) more information and using assumptions to "fill in the gaps." If this is not viable, decision-makers compare courses of action to reduce uncertainty or they prepared contingencies (forestalling). Finally, if all else fails, decision-makers resort to suppressing anxiety.

Within the SAFE-T model uncertainty is characterized as either endogenous (in that it is derived from uncertainty about the event itself; Klein 1993) or exogenous (in that it stems from the surrounding management and team processes; van den Heuvel, Alison & Power, 2014). Endogenous sources of uncertainty include ambiguous information, time pressure and risk (Orasanu & Connolly, 1993). Endogenous uncertainty, therefore, prevents the decision-makers from developing SA (i.e., "what is going on") as well as their ability to prospectively model future outcomes of courses of action (i.e., "what will happen *if*"; Klein, Pin & Snowden, 2007). Efforts to decrease exogenous uncertainty can hinder effective decision-making by delaying action through redundant searches for information. Time pressure specifically can derail decision-making by reducing cognitive flexibility and decreasing the decision-makers' ability to generate multiple differing courses of action (Macquet, 2009; see also Alison, Doran, Long, Power & Humphrey, 2013). Furthermore, the perception of time pressure (rather than an actual pressure) is enough to derail decision-making in certain types of individuals (see Alison et al., 2013).

Exogenous uncertainty derives from confusion over one's own expectations or expectations of another's performance (van den Heuvel et al., 2013). Within team-based decision-making, poor role understanding reduces confidence (Shanteau, 1997) and self-efficacy (Bandura, 1997), both of which are important for goal setting and action planning (Olsen, Roese & Zanna, 1996). Poor role understanding can also impede inter-personal trust within a team that can, in turn, affect confidence and perceptions of reliability regarding other team members' judgment and advice (Budescu & Rantilla, 2000). Endogenous uncertainty can also affect team cohesion, reducing team members' willingness to share (McKay, 1991) and seek information (Sniezek & Van Swol, 2001). Naturalistic research on police decision-making in a hostage negotiation

scenario found that exogenous uncertainty was more common than endogenous uncertainty and affected the planning and execution phases of decision-making (van den Heuvel et al., 2013).

Integrating the SAFE-T Model with the MDMP

The SAFE-T model shows a high degree of overlap with the current MDMP. But it differs on several critical components; namely the possibility for decision-making to become derailed, and the impact of several environmental factors such as accountability and time pressure on decision-making. The SAFE-T model also has a high degree of overlap with the Recognition Prime Model of military decision-making (see Klein et al., 2003) and with other well-known military decision-making models such as the OODA loop (Observe, Orient, Decide, Act). The OODA loop was developed by John Boyd (1996), and involves taking in observations of the situations (i.e., SA), making judgments of the situation, understanding what it means, developing options (i.e., PF) and acting (i.e., PE). Thus, in being informed by previous phase models from the decision-making literature, and in being structurally similar to the MDMP (and OODA), the SAFE-T model has a high degree of both pragmatic utility and scientific validity.

What the SAFE-T model adds above and beyond these models, however, is a series of "error traps" that can be encountered along the way, adding theoretical insight into the potential ways in which decision-making can stall during high-stakes military operations (van den Heuvel et al., 2012). Figure 2 shows an expanded version of the MDMP model that integrates both the derailment pathways highlighted by the SAFE-T model (and expanded by Power, 2016) and the cognitive, ambient, organizational and affective factors that can increase the likelihood that decision inertia will emerge.

Let us walk through Figure 2 to show it in-action. Let us consider that an event happens and a mission is received (e.g., launch a raid on a local compound). In both the MDMP and the SAFE-T model, the first stage of the process is mission analysis; assessing the situation and trying to understand what is going wrong. Now, what the SAFE-T model adds here, is that the decision maker may (for a variety of reasons), after assessing the situation, avoid it, and not move onto the next phase. If they do not avoid it, they will then move onto the next phase plan formulation.

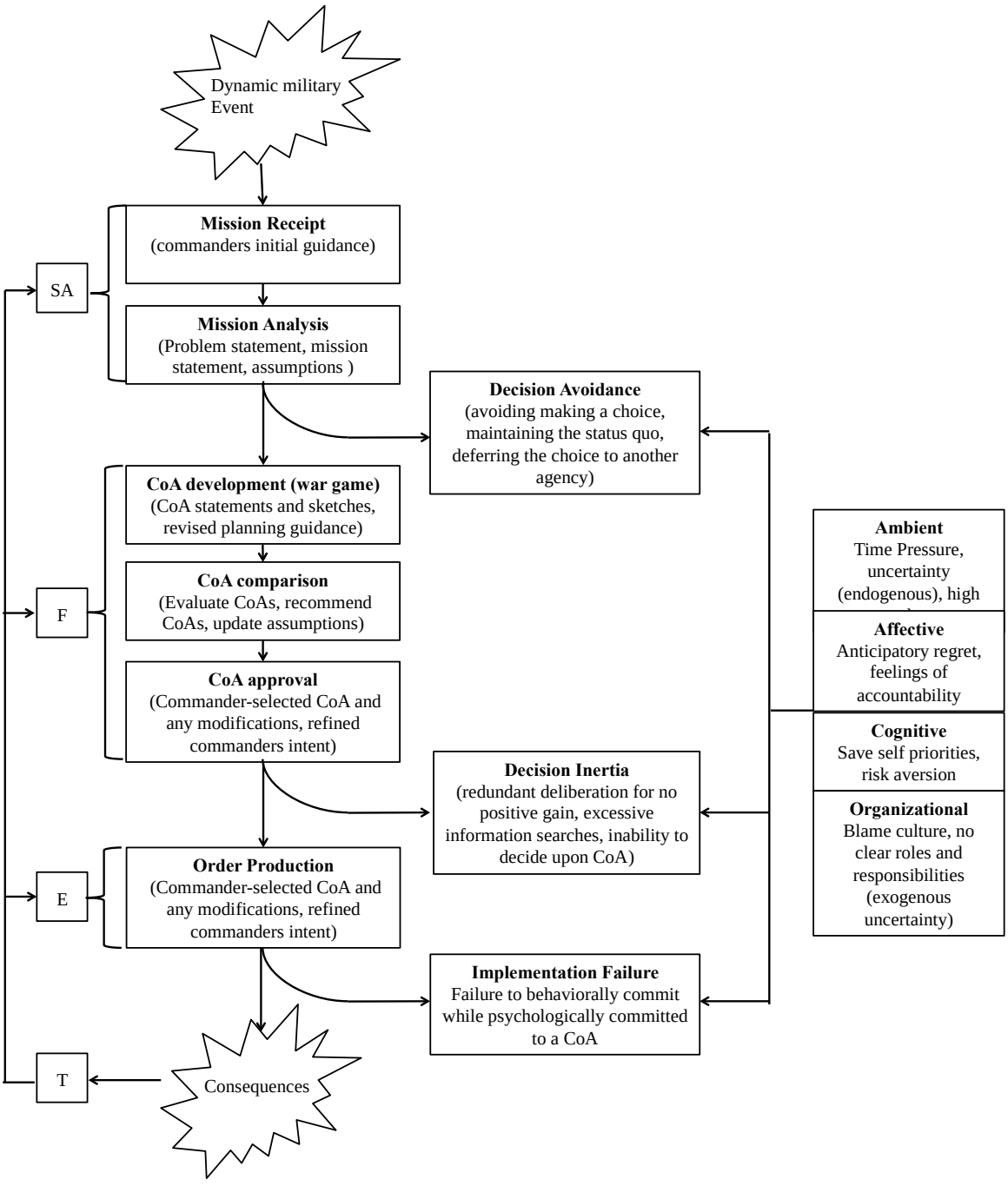

Figure 2: The integrated SAFE-T/MDMP model of military decision-making identifying derailment points and factors that can increase the emergence of decision inertia.

With the SAFE-T model, plan formulation involves identifying the best course of action to take for a given situation. In this case, how specifically to go about the raid. It thus reflects the three MDMP steps of CoA development, comparison and improvement (interestingly the SAFE-T model, unlike RPD and MDMP, does not specify if the comparison is sequential or parallel, all that matters is that eventually, a CoA is chosen). However here, once again, the SAFE-T model offers another avenue of de-railment. Let us imagine, for example, that our Soldier finds it hard to choose which is the best method to launch the raid. Furthermore, in agonizing over this decision (and the risks and benefits of each CoA), they actually do not manage to launch a mission in time and the target escapes (rendering the mission a failure). This, in respects to the SAFE-T model is decision inertia. Finally, let us imagine that they do decide on a CoA. In the MDMP those orders would be produced and the mission launched. However, in the SAFE-T model, while the process is the same, there is still one further step for potential de-railment in which the decision is made for a CoA, but the orders are not produced, and, hence, the mission is never launched. This is implementation failure.

When looking at an integrated SAFE-T/MDMP model it is arguable that many of the factors highlighted by the SAFE-T model are present within the military decision-making environment. Firstly, military operations are conducted in a highly accountogenic environment. In addition, media access to military operations may be increasing feelings of accountability. While embed journalists within the military and technological advances such as social media are providing a "'real time' and transparent imagery of life on the front line" (Kennedy 2008, p. 285) members of the military are increasingly being held accountable for actions made during war in domestic courts. As James Gow (2013) argues, "global coverage and the rise of social media as a platform for documenting conflicts went hand in hand with the proliferation of international criminal tribunals, stirring intense debate over boundaries between right and wrong, legal and illegal, in contemporary warfare."

Furthermore, the SAFE-T model also highlights the important role of uncertainty in military decision-making. Experimental research supports that, in military operations, endogenous uncertainty can increase decision inertia. Specifically, research employing scenarios developed from real experiences of uncertainty during Operation Enduring Freedom found that decision-makers with missing information took significantly more time to decide upon a course of action

that those who were provided with conflicting information. Furthermore, both groups with missing information and ambiguous information took significantly longer to decide upon a course of action that the baseline group (with no uncertainty). In addition, those who took a long time to assess the situation also took a long time to decide upon a course of action (Shattuck, Miller & Kemmerer, 2009). This implies that endogenous uncertainty in a military context has the effect predicted by the SAFE-T model in that uncertainty during the SA phase caused repeated and redundant requests for information whereas uncertainty during the PF and PE phases led to choice deferral and the decision-maker adopting a "wait and see" mentality (van den Heuvel et al., 2012, p. 181).

The SAFE-T model also posits an important destabilizing role of exogenous uncertainty, which, while receiving far less empirical attention, is equally prevalent in the military decision-making environment. Specifically, in Afghanistan and Iraq there have been large-scale tactical and strategic adaptations of military forces and an overhaul in the type of operations that Soldiers have been undertaking (see Farrell, Russell & Osinga, 2013; Kahl, 2007). Soldiers deployed to Iraq and Afghanistan found themselves undertaking extensive population-centric operations that they had not engaged (nor been trained) in before (Nagl, 2012). This adds a degree of role and task uncertainty into the military decision-making process. Additionally, military operations are often conducted in partnership with other, multi-national units with whom individuals have varying degrees of previous experience with one another. Ben-Shalom's field research with members of the Iraqi Defense Force (IDF) showed that many combat situations present the military equivalent of a "one night stand" in that they "have a finite life span, form around a shared and relatively clear goal or purpose, and their success depends on a tight and coordinated coupling of activity" (Ben-Shalom, Lehrer & Ben-Ari, 2005, p. 77). In addition, both military operations in Iraq and Afghanistan relied upon partnerships with indigenous forces that can often increase exogenous uncertainty. Bordin's (2011) interviews with members of the International Security Assistance Force (ISAF) in Afghanistan demonstrate several sources of exogenous uncertainty within this partnership. Specifically, ISAF forces had low confidence in their Afghan counterparts ("the overall quality of the ANA cannot be intelligently described. It would benefit Afghanistan to disband the ANA and start over again."), low interpersonal trust ("While on patrol.... I don't trust them," "I wouldn't trust the ANA with anything, never mind my life") and a perception of incompetence ("They are just about useless; genuinely stupid," "We are interfering with Darwinian Theory!"). When looking at more recent experiences in Afghanistan it would also be viable to

propose that the increased emergence of green-on-blue attacks (also referred to as "insider attacks") would also be a significant source of exogenous uncertainty, specifically during combat-related decisions.

Implications of the SAFE-T Model for Military Decision-Making

The first important implication of the SAFE-T model as it pertains to the MDMP is that it provides a systematic way in which researchers can focus on how the decision-making process, rather than the outcome, falters in high-risk and often least-worst situations. In such cases, it is more appropriate to look at the process by which decisions are made (or not made) rather focusing solely on the outcome (Woods, Johannesen, Cook & Sarter, 1994). In doing so the SAFE-T model can serve as an important tool for explaining erroneous decisions *post hoc*. The After-Action Review (AAR) is "a professional discussion of an event, focused on performance standards, that enables Soldiers to discover for themselves What happened, Why it happened and How to sustain strengths and improve on weaknesses" (United States Army, 1993). The decision-making behind large-scale operational errors (such as Operation Anaconda; see Hastert, 2005) is often scrutinized and the integrated SAFE-T model, therefore, affords a pragmatic, objective, analysis of the decision-making process that is specifically focused on identifying where, within a dynamic, uncertain and complex environment, decision-making became derailed.

Furthermore, knowing the antecedents of decision inertia can also help inform decision-making training for military officers in that it can expose decision-makers to situations in which decision inertia is likely to emerge. Elsewhere research has shown that inertia can often be the result of goal-conflict, in which the decision-maker struggles to decide between approach-motivated goals (e.g., "save life") and avoidance-motivated goals (e.g., "prevent further harm"; see Power, 2016). Knowing this can be used to inform training scenarios for military decision-making training. Currently, the military (in line with RPD) attempts to train Soldier intuition by exposing Soldiers to a series of increasingly complex missions, in doing so "the learner begins to build his or her own library of experiences that can ultimately be tapped into when an intuitive decision is called for" (Matthew, 2013, p. 67). Yet as I highlighted above many decisions cannot be responded to with an individuals' "library of experiences," and in such cases, it would be beneficial to expose individuals to the ways in which, when facing novel situations, their decision-

making can become derailed. Focusing on the ways in which the *process* of decision-making can become derailed also has significant training benefits in that "explicitly addressing these 'derailment pathways' in training programs will forewarn [the trainees] of the potential pitfalls and dangers associated with these maladaptive cognitive processes." (van den Heuvel, et al., 2012, p. 184). Matthews (2013) states that while military experts know *what* to train, cognitive psychologists know *how* to train. Thus, by identifying the elements of a decision (and the decision-making environment) that increase the likelihood that a decision-maker will struggle to choose, cognitive psychologists can begin to develop training scenarios (and empirically informed interventions) that can improve military decision-makers' ability to deal with such situations when deployed. Furthermore, because individual differences are likely to moderate the effect of these variables (see Alison et al. 2013; Parker, be Bruin & Fischoff, 2007) the results of research in this area can support wider questions of force selection by identifying a series of cognitive factors (e.g., high fluid mental ability, or a low need for closure) possessed by individuals who can maintain robust decision-making strategies in the face of least-worst decisions.

Finally, the SAFE-T model provides an experimental framework to guide future research in military decision-making. Todd and Girgerenzer (2000) argue that NDM perspectives avoid detailed theorization due to the (mistaken) belief that decision-making processes in high-stakes environments cannot be modeled, precluding the development of detailed hypotheses (see also Serfaty, MacMillan, Entin & Entin, 1997). On the contrary then, the SAFE-T model (and integrated SAFE-T/MDMP model) offers a series of testable hypotheses, derived from experimental research elsewhere as to the likely effect that certain affective, organizational, cognitive and ambient pressures should have on the MDMP. For example, we can hypothesize that time pressure will negatively affect CoA development (Alison et al., 2013) while high levels of uncertainty will cause choice deferral (van den Heuvel et al., 2012). Feelings of accountability will affect the SA phase of the MDMP because the decision-maker is unable to discriminate between relevant and irrelevant information (Waring et al., 2013). High levels of exogenous uncertainty will decrease collaboration and information sharing within teams, while also derailing decision-making by increasing role confusion (van den Heuvel et al., 2013). Adopting the SAFE-T model therefore offers a series of testable hypotheses surrounding the role of exogenous and endogenous sources of uncertainty on decision-making and decision inertia.

Restrictions of the SAFE-T Model

There are several restrictions in integrating SAFE-T with the MDMP that should be considered before I move on with this thesis. Firstly, as stated above a significant portion of the utility of the SAFE-T model is the identification of inertia traps, however, I am yet to prove empirically that members of the military become "inert." General George S. Patton, Jr.'s military adage holds that "a good plan violently executed now is better than a perfect plan next week." Military organizational culture and training emphasize making prompt decisions at the cost of searching for a better outcome. Specifically, and with regards to the OODA loop model of decision-making, the basic strategy for defeating the enemy is to "get inside his OODA loop" by executing your OODA loop faster than they can. Thus, within military decision-making there is *even more* pressure for fast decisions as this will allow them to take and then keep the initiative in a battle (Dupuy, 1984). What this means then is that members of the military, in comparison to other critical incident responders who face (arguably) similar types of decisions (e.g., police officers and members of the fire service) may be less likely to suffer decision avoidance, decision inertia or implementation failure, opting instead to execute *any* plan now. That said, while this may decrease the utility of the SAFE-T model for military decision-making, it does not decrease the warrant for further exploration in this area. Given that decision inertia has been seen in these other domains its absence (relative, or absolute) in military operations would provide an important comparison point. Identifying what (if anything) allows members of the military to be resilient to decision inertia may then inform future interventions (e.g., training) across other critical incident responders. For future research then the first step is to apply methods from NDM (specifically critical incident decision tasks; see Crandall, Klein & Hoffman, 2006) to members of the Armed Forces to collect narrative accounts of military decision-making in the field to examine the situations in which they navigate goal conflict and least-worst decisions to see if inertia emerged (for early stages of work in this area see Shortland & Alison, 2015).

Conclusion

In war (and in many high-stakes situations) decision-makers often face new and novel situations in which they have little prior experience, and the outcome of any decision has the

potential to be high-risk and adverse. While I do not disagree with the utility of RPD as a decision-making strategy to make fast, effective, decisions in military (namely tactical) environments, RPD (and more rational models such as that purported in the MDMP) alone are insufficient to explain, from a naturalistic standpoint, the ways in which members of the military can navigate these complex least-worst situations. Specifically, neither RPD nor the MDMP account for the way in which decisions are influenced by a series of ambient, organizational, and environmental factors such as accountability, uncertainty, and anticipatory regret that elsewhere have been seen to affect decision making. As such, and to spur the theoretical direction of this thesis, in this chapter I proposed the utility of incorporating the SAFE-T model of strategic decision-making to the field, especially as a theoretical framework to understand situations in which critical time-sensitive decisions are stalled or avoided. In support of this effort in this chapter I identified both the pragmatic and scientific validity of the model (in that it demonstrates clear overlap with the current MDMP and other phase-based models of decision-making). I also showed the theoretical, empirical and pragmatic benefits of applying (if confirmed through further scientific study in this area) aspects of the SAFE-T model into military training. Finally, and perhaps most importantly, we highlighted the importance of decision inertia as the result of a dynamic, cognitive, social and organizational process (Alison et al., 2015). Military culture places a premium on timely, effective decision-making. In the military, then (even more than other critical incident environments such as the police and fire), inertia within the decision-making process can have significant negative consequences, emphasizing the importance of both theoretical and empirical efforts that identify the manifestations and antecedent factors of indecision in the military decision-making process. In the next chapter, I test the utility of the SAFE-T model as a knowledge gathering framework to examine military decision-making.

CHAPTER 4: MILITARY DECISION-MAKING ON DEPLOYMENT

'Oops?' What the fuck do you mean 'Oops?'

- Unidentified camera operator to a Predator Drone pilot before takeoff, July 24, 2012.

It is viable to propose that military operations are perhaps one of the most time-pressured and uncertain environments within which a decision can be made. However, there currently exists little research that specifically centers on the cognitive processes that underpin the decision-making of military personnel when they are on deployment. While the observation of decision-making during training scenarios offers many benefits (including increased experimental control, the ability to isolate and manipulate situational variables etc., for a discussion of this see Alison, van den Heuvel, Waring, Power, Long et al., 2012) such methods are, arguably, limited in the degrees to which they can effectively re-create the actual environment within which such decisions are made. Furthermore, while there are studies that examine Soldiers under conditions of physiological load, such studies often focus instead on the physiological reactions to such conditions, rather than decision-making strategies that are employed (e.g., Kobus, Brown, Wu, Robusto & Bartlett, 2011; Mahoney, Hirsch, Hasselquist, Lesher & Lieberman, 2007). Other research that has examined Soldiers' performance during high-stress SERE (Survival, Evasion, Resistance and Escape training) often focusses on the physiological changes that are caused by exposure to severe stress rather than their performance and decision-making within such situations (e.g., Taylor et al., 2008). Even the notable exception of Larson (2001) is flawed, because while he did investigate decision-making in stressed, deprived military students, this was merely an inhibitory shoot/don't shoot decision. It was, in this sense, a test of behavioral inhibition under conditions of extreme deprivation rather than a test of decision-making. Thus, when commenting on the process through by which military decisions are made there is a dearth of research that not only uses the practitioners themselves but more importantly examines real decisions made by these individuals in wartime conditions.

Given this, and to test the theoretical claims made in Chapter 3, in this chapter I used the Critical Decision Method technique (CDM; Klein et al., 1993) to capture data on the decision-making strategies used by Soldiers who have faced least-worst decisions on deployed service.

CDM is a knowledge-building tool for generating theories and data on the process of making complex decisions in conditions, such as the military, that are defined as *in extremis* (that is they "at the point of death," Kolditz, 2006, p. 655). Specifically, this chapter seeks to explore, from the perspectives of the Soldiers' themselves, the cognitive underpinnings of the decisions they made at war. However, I am not interested in just *any* decision. I specifically seek to explore the cognitive underpinnings of what I (and others; Alison et al., 2015) call "least-worst" decisions; those damned if you do, damned if you don't, high-risk, rare, "black-swan" decisions that many Soldiers face, yet few are ever trained to deal with. It is these decisions, as argued in Chapter 2, that fall in the gaps left between rational doctrinal decision strategies and more common RPD strategies. Furthermore, in line with the SAFE-T model outlined in Chapter 3, I seek to understand how, under conditions of high-risk, time pressure and uncertainty, Soldiers to navigate least-worst decisions without being paralyzed, or derailed by decision inertia. In doing so I hope that this chapter provides an important addition to the extensive body of research that has applied NDM (specifically RPD; e.g., Klein, 1998, 2005; Thunholm, 2005) methods to understand how, with high time pressure and uncertainty, Soldiers can make fast, effective decisions.

Method

Participants

13 current, or veteran, members of the United States Armed Forces (Marine, Army, Navy, Air Force; however, there were no participants from the Coast Guard) were interviewed for the first part of this study. All participants had served on deployed duty in Afghanistan or Iraq since 2001 (many had also served in other foreign theaters). Participants were opportunistically sampled and were not restricted by rank, or length of service. As such, participants included members of the Armed Forces who served in tactical level positions for a short time (or as a reservist) before leaving the military as well as those who had long careers in the Armed Forces and served in high-ranking command positions at the time.

Critical Decision Method

Collecting data during "live" cases of decision-making in high-stakes situations has clear methodological constraints. As such a powerful qualitative research method is to probe actual events *post hoc*. CDM interviews are a form of Cognitive Task Analysis (CTA) method that seeks to understand decision-making in a specific, often unique, incident that a practitioner faced in the real-world. CDM therefore provides a method of collecting, in retrospect, insight into practitioners' decision-making processes. The CDM helps practitioners "tell stories"; it is a single incident-centric method and requires the participant to select and recall a single (ideally rare) incident in detail. In doing so, it allows researchers to gather information on the incident, the incidents' background, and the individuals' cognitive functions during the event (such as planning and sense making). It also allows researchers to identify critical decision-points. CDM, therefore, develops rich and detailed data on the cognitive processes used by experts when responding to challenging events (Crandall, et al., 2006). One of the distinct advantages of CDM then is that decisions are explored *post hoc*, rather than *in situ*, meaning that detailed data can be collected without putting the researcher (or more importantly the participant) in harms' way. In fact, the CDM was developed in part due to issues collecting data on the decision-making of firefighters while "in action" (see Crandall, Klein & Hoffman, 2006). CDM has several benefits; it gives indications of the cues and patterns that experts perceive; "rules of thumb" they have devised; the kinds of decisions they are required to make; as well as features of tricky, typical and rare decisions (Crandall et al., 2006).

CDM involves an extensive (over 2 hour) interview and has previously been used to elicit data points for decision-making in nurses (Crandall & Getchell-Reiter, 1993), ambulance dispatchers (Wong & Blandford, 2002) intelligence analysts (Hutchins, Pirolli & Card, 2004), pilots (Plant & Stanton, 2013), diagnosticians (Islam, Weir, Jones, Del Fiol & Samore, 2015), ophthalmic surgeons (Pauley, Flin & Azuara-Blanco, 2013) and military command and control (Pascual & Henderson, 1997). CDM interviews involve four "sweeps," each sweep uses different types of probes and perspectives to facilitate the quality of recall (Crandall et al., 2006). The first sweep results in the selection of an incident that matches the requirements of the research and the goals for data collection. Usually, CDM focuses on non-routine decisions and challenging events because these have the greatest potential for uncovering aspects of a given cognitive phenomena.

This is also important to ensure that the interview catches cognitive processes beyond procedural and routine knowledge, allowing insight into the characteristics of skilled and expert performance (Crandall et al., 2006). Once a candidate event has been identified the interviewee is asked to recall the event from start to finish. The second sweep involves the participant developing a visual (or verbal) timeline of the event. In developing a timeline participants are encouraged to highlight "critical points" during which the decision-maker experienced a major shift in their understanding of an event, or an action was taken that changed the event (Crandall et al., 2006). During the second sweep inconsistencies, gaps, and missing elements are also identified, allowing the interviewer and interviewee to arrive at a shared view of the facts. The third sweep involves "deepening", within which the interviewer uses a series of cues to investigate the practitioners' cognitive experience of the event (i.e., their expectations, mental models, assessment, and experience). The third sweep goes beyond the timeline to seek out the participant's perceptions, expectations, goals, and uncertainties during the incident. During this sweep, the interviewer uses probes for additional information and elaboration from the participant. The final sweep of the CDM involves questioning the "what if's" of an event. In this sweep a series of probes aimed at identifying hypothetical factors (within the environment, or the decision-maker) that would have resulted in a different outcome or experience (see Crandall et al., 2006, p. 69-83).

Our CDM interviews started with this statement:

> "I am going to be asking you in a moment to spend some time thinking about a decision that you had to make, while in the Armed Forces, in which you had to choose between one or more options and in which you spent a lot of time thinking about all the possible outcomes."

After the participant felt they had identified a situation that met these requirements, we proceeded with the four sweeps of the CDM. First, the participant outlined the event to ensure that it met the requirement of the study. After this, the participant was asked to provide a timeline (auditory, or visual through drawings) of the event identifying key decision points, key actors, key events, and outcomes. Next, the "deepening" began in which (using a semi-structured interview technique) I used a series of probes to further delve into the decision-making of the participant. The probes used in this part of the interview are outlined in Table 4. Where possible, all probes were used for

each participant, however, in some cases the probe was irrelevant and hence, not asked. Finally, after deepening probes were exhausted, participants were asked a series of "What if" questions to explore what aspects of the situation, if changed, would have changed their decision-making. These "what if" probes were unique to each interview, but generally centered around identifying which aspects of the decision-making environment, if changed, would have altered their decisions. It was, in this sense, a test of threshold and commitment to a course of action, as well as a useful framework for identifying central aspects of factors that played an especially important role in their decision calculus. For a full outline of the recruitment and interview method please see Appendix A – F.

Topic	Cues
Information	What were you hearing/thinking/noticing during this situation?
	What information did you use in making a decision or judgment?
	How and where did you get this information, and from whom?
	What did you do with this information?
	Did you discard any information that you received?
Analogs	Did this situation remind you of any previous experiences you have had?
Standard Operating Procedures	What were the parallels you drew between the situation and others?
	Did this case fit a standard scenario?
	Is this the type of event you were trained to deal with?
Goals and Priorities	What were your specific goals and objectives at this time?
	What was the most important thing for you to accomplish at this point?
Options	What other courses of action were considered?
	What courses of action were not considered, and why?
	Was there a rule that you were following in choosing this option?
Experience	What specific training or experience was necessary or helpful in making this decision?
Assessment	If you were asked to describe the situation to someone else at that point, how would you describe it?
Mental models	Did you imagine the possible consequences of this/these action(s)?
	Did you create some sort of picture in your head?
	Did you imagine the events and how they would unfold?
	How close was your imagined outcome to the actual outcome?
Decision-making	What let you know that this was the right thing to do at this point in the incident?
	How much time pressure was involved in making this decision?
	Did you think about it for too long?
	Were you ever worried about the time it was taking to make the decision?
	How long did it take to actually make this decision?
Guidance	Did you seek any guidance at this (or any) point in the decision?
	How did you know to trust the guidance you got?
Feelings	How did making this decision-make you feel?
	How did you feel about potentially making the wrong choice?

Table 4: CDM probes used to explore participants' decision-making strategies.

Data Analysis

CDM interviews were transcribed, anonymized and subject to thematic analysis. Thematic analysis is a form of content analysis. Content analysis methods present and evaluate information in a systematic, objective and reliable manner allowing conclusions to be drawn from data that is rich in detail and applied to a particular context. Thematic analysis is defined as "a method for identifying, analyzing and reporting patterns (themes) within data. It minimally organizes and describes your data set in (rich) detail" (Braun & Clarke, 2006, p. 79). As such quantities of diverse data, such as that collected here, can be minimally organized yet described in rich detail (Braun & Clarke, 2006) and common themes can emerge independently from word frequencies (Simons, Lathlean, & Squire, 2008, Hsieh & Shannon, 2005). Here, the thematic analysis followed the step-by-step procedure provided by Braun and Clarke (2006) and was performed using the qualitative analytical software nVivo (Gibbs, 2002).

The first stage of analysis involved establishing 'codes' within the data. Codes identify a feature of the data (both semantic and latent content) that is of interest. Codes are "the most basic segment, or element, of the raw data or information that can be assessed in a meaningful way regarding the phenomenon" (Boyatzis, 1998, p. 63). Codes are then grouped together into 'themes'. To achieve this, codes were inspected for consistent informational threads (recurrent elements of narratives) and clustered together to form coherent themes. Inter-relation between themes was also considered to identify candidate themes and sub-themes. The accuracy of the thematic analysis was then tested by providing a sample of codes to an additional researcher, also trained in qualitative analysis, to provide a metric of inter-coder reliability.

Results

The Manifestations of Least-Worst Decisions in Conflict

First and foremost, while all the decisions discussed in this research occurred on deployment; most the decision discussed did not involve kinetic operations (60.87%). In most cases, the least-worst decisions that they faced did not involve a decision to take offensive action against a potential target. Instead many of the least-worst decisions that were faced were logistical,

and even personnel centered. To put this point in perspective, in my sample of Soldiers who had conducted multiple tours of duty and hundreds of *in extremis* kinetic operations, for many, the decisions that they identify as challenging were not faced "at the point of death" but instead in the headquarters, or basecamp. However, what all decisions in my data have in common is that they were least-worst meaning that, the decision-maker could not clearly identify a "good" option and was instead faced with multiple courses of action that could all, equally, result in an adverse outcome. As hypothesized throughout this thesis, my data supports that such decisions are highly challenging for Soldiers, and have significant moral and organizational implications. As one Soldier recalls;

> *But there is the other side of me that looks at it and says, you know, that if I fired and wasn't supposed to, not only would that have probably ended my career, forget my career, I would have had to have lived the rest of my life knowing I had killed that guy. I don't know what other people's impression of the military is - if we take these decisions lightly - but I certainly didn't and I don't think other people do either. And the idea that you become jaded to the point when you stop caring about hurting innocent people, I can't imagine becoming that jaded about that decision, in fact, it still bothers me to this day, the idea that I, in a fraction of a second, I could have shot that guy. And if he was you know, Taliban, great, but if he wasn't, you know, I can't imagine the thoughts that would go through my head about that guy's family, and things like that. So, it is a hard decision to live with.*

Another Soldier equally recounts the difficulties of making decisions when it is not clear which course of action will have a "better" outcome;

> *You never know if it is the right decision or not. Someone could have parked a car bomb right there on the side of the street next to it, you could have had multiple casualties, stuff like that was running through my mind. Stuff like that was running through my mind you know, what is the worst thing that can happen. You see it might be, plugging the cobalt beneath the street full of explosives and just waiting for us, and just baiting us with that. And all that stuff was certainly in the back of*

my mind. It was those kinds of risks. And then someone would say, man, that was totally the wrong call, putting that many people in that kind of an area, you just created this huge target. And you know, was this scraper worth it? So that was always there. But I always felt like, and I probably felt on most of my missions that I always did everything I could do to mitigate risk.

"Unique" decisions

When looking at the nature of the decisions that my sample identified as "least-worst" it is important to consider the types of decisions they were trained for. Members of the Armed Forces are trained to make fast, and accurate decision in war (Matthews, 2013), and several models (such as the Military Decision-making Process, or OODA Loop Framework; Observe, Orient, Decide, Act; Boyd, 1987) have been developed to allow members of the Armed Forces to "apply critical and creative thinking to understand, visualize, and describe unfamiliar problems and approaches to solving them" (ADP 5-0. U.S. Armed Forces, 2012). However, the domains (and scenarios) within which these decision-making strategies are trained, are often *routine,* that is; they test and train individuals with the types of tasks and missions that reflect the types of task and mission that they will be required to perform repeatedly during their future operations. Least-worst decisions, by their very nature are often rare, atypical events that are dissimilar to situations previously faced by the decision-maker. What this means is that most decisions that were recalled as part of this study were tricky specifically because they were completely different to the types of decisions that made in training. As one of my interviewee's (a drone pilot) stated:

Interviewer: So how did this decision differ to the ones you'd faced in training? AFC Evans: Training is easy, you know you just do it you're given missions without thought and you're not giving, you're never given scenarios where Afghans may be doing this or they may not. Go look at this, find this, do this, get a beer after or a steak dinner. It's not like this where you live on a base that's getting rocket attacked and stuff. Everything plays into it. There were a few times we were wearing our gear while we were flying because we were getting attacked. Nothing training can do.

Linked in with this point was the finding that in all cases discussed here, the decision (for one reason or another) was "unique" meaning that the decision-maker had not faced (in the real world, or training) a decision like this. Currently, the military (in line with RPD) attempts to support Soldiers' decision-making by developing their intuition through exposing Soldiers to increasingly complex missions, aimed at building "his or her own library of experiences that can ultimately be tapped into when an intuitive decision is called for" (Matthew, 2013, p. 67). But in this research the decisions that participants faced did not match the "library of experience" they had developed through prior deployments and training. One interview, for example, was with a driver working in Afghanistan and providing rear support to a large convoy of oil that needed to be delivered to a Forward Operating Base who used his truck to protect the convoy from what he thought could have been a vehicle-borne improvised explosive device that was heading directly for them. He explained this situation as unique:

> *This particulate situation was unique, and, especially where we had two things happen one after another, I mean, this is 2010. This is when the whole drawdown was going on any everything, does it compare, from what other people told me, these were pretty quiet times, except you would have your spurts every now and then, and this was a lot a precursor to ISIS* [the Islamic State] *and everything, they were fighting amongst each other and less against us, I think we were just waiting it out. But yeah, I uh, yeah, I this was really a unique situation, I cannot think of another situation where it was like this, this was the only one I had to write a statement on! So, yeah, I mean, we'd had trucks try to force their way into our convoys but never like this.*

Uncertainty

In many cases, least-worst decisions emerged due to the "fog" of war; meaning that the uncertainty in the situation created a least-worst decision because the decision-maker did not have enough situational awareness to be able to effectively project the likely outcome of an action,

instead they could only project the outcome of two, very different outcomes, both of which were often in conflict. As one Soldier recounts

> *Now at this point, and you talked earlier about a point at which there was no good decision, I don't know what their intent is, I know they are coming straight at my guys, at my friend, um, and I don't know what I am supposed to do right? I don't know if this guy is a danger or not. And I also don't know, with an SUV you've got a fair amount of cargo capacity there, so I'm thinking this could also be a bomb? So, inside my head, I am thinking "he's going to die," this guy is going to blow himself up, because, just the way he came out, he really tore his way out of that parking lot and came right at them... and there was a split second when I thought I can save [the walk in's] life right now by possibly murdering an innocent person. And on the other side of it, and I had to weigh that against, do I want my friend to possibly be killed, and at the same time I'm thinking, it's possible that if I shoot at this guy, it isn't going to save my friend anyway right?*

As another interviewee stated during our interview:

> *"That was all uncertainty on my part, I felt like that might be a threat, but I wasn't sure enough if it was, right. On the one side, you know I've got a deadly weapon and intent, I just don't have the know-how, I just don't know whether I should be firing or not. And so, I guess some part of me is worried about killing him, and about escalating a situation that was non-hostile. And so, that was probably a larger factor in my mind and, um, I'm thinking I don't want to screw this up, and so I'm really going to pay attention to what they are doing, and um, I think if they had been, you know, he was drawn on the guy and I was drawn on the guy he was ready to fire and I was ready to fire. If, um, we had heard, if a round had gone off I would have been firing immediately, no question about it, if*

you know the driver had shot or my guys had shot I would have fired without hesitation, but I didn't know, I wasn't sure if I was supposed to fire."

The finding that uncertainty in the situational awareness is directly in accord with Lipshitz and Strauss' (2001) work with members of the Iraqi Defense Forces Command and General Staff College. Lipshitz and Strauss asked Soldiers to "write a case of decision-making under uncertainty from your personal experience in the I.D.F." Their results showed that the two most common sources of uncertainty were that they inadequately understood the situation (24.6%), and they were conflicted due to having alternatives with equally attractive outcomes (24.6%; p. 156). It is clear, however, that these two issues are causally linked in many cases in that a poor understanding of the situation can create the perception of equally unattractive outcomes because the decide-maker is unable to prospectively project the outcome of a given course of action. In being unable to prospectively project the outcome of a given course of action the decision-maker is unable to employ RPD strategies because, without knowing (with any degree of certainty) what the outcome of decision will be, the decision-maker cannot identify if it is "satisfactory" or "workable".

Endogenous Uncertainty

In Chapter 3 I outlined the SAFE-T model, and in doing so, identified a series of factors that can impact upon the decision-making of individuals during critical decisions. Here, participants highlighted several factors within the decision-making environment that detrimentally affected their ability to make decisions. Endogenous sources of uncertainty include ambiguous information, time pressure, and risk (Orasanu & Connolly, 1993). They prevent the decision-maker from developing situation awareness (i.e. "what is going on") and, as I argued above, affects the ability of decision-makers to prospectively model outcomes of an action (i.e. "what will happen if"; Klein, Snowden, & Pin, 2007). Exogenous uncertainty has received even less attention from scholars of military decision-making. Exogenous uncertainty derives from confusion over both one's own expectations and their expectations of another's performance (van den Heuvel et al., 2013). Exogenous uncertainty can derail teamwork by affecting team cohesion and reducing team members' willingness to share (McKay, 1991) or seek information with other partners (Sniezek &

Van Swol, 2001). In several cases collected as part of this study, not only did the decision-maker had to deal with endogenous uncertainty, but also exogenous uncertainty surrounding the roles and actions of other members of the decision-making team. Sveral participants were either forced to make a least-worst decision because of uncertainty surrounding the intentions and actions of others. For example;

> *One of the reasons I was forced to do something in this situation was because the gunner didn't. Had she lit up that truck, she would have been 100% justified, whether they were innocent or not, you know, she would have seen the threat coming. I think if it was any other people that were up there. But I mean if it was my regular gunner, I mean, whoever was in that vehicle probably wouldn't have got home that night, you know. So… She knew very well it was a threat because she was yelling it out. She just didn't do anything about it and so it was kind of left up to me with the truck, or to let them pass.*

In other cases, they struggled to decide due to uncertainty stemming from their interactions and relationships with others:

> *It was frictional, I mean even us going and asking. They have their own priorities and missions and this is just a distraction for us. We almost had to go through another unit to get to even set up direct communications with them. And that's hard, just the communications piece. [at one point] I flew a guy up there just to have a face-to-face meeting…. So that was kind of the interaction with the Poles, all of which had to be done though interpreters.*

Hence the data supports that not only does uncertainty cause a least-worst decision by creating outcome uncertainty, but exogenous uncertainty within the decision-making team can hinder the decision-making process by introducing issues of role confusion, cohesion, and trust which creates barriers to decision-making.

Organizational Pressures

In addition to uncertainty, participants frequently referenced the role of organizational pressures such as accountability and "blame culture" in their decision-making. In decision-making, future accountability influences choice (Frink & Klimoski, 2004). NDM research has shown that, accountability increases cognitive load (Tetlock & Boettger, 1989). Accountability also increases self-preservation and detracts attention away from the task at hand (Waring et al., 2013). To date, little research has explored the influence of accountability on military decision-making, even though military culture "vests considerable authority, responsibility, and accountability with the commanding officer" (Broedling, 1981, p. 91). Accordingly, several participants highlighted both the role that organizational pressures played in both the way in which they decided and specifically, the course of action that they chose. As highlighted by one interviewee:

> *The culture at the time was a fault intolerant culture, right, they were more worried about whether you followed the procedure right, um, than whether they were setting you up for paranoia. Your paranoid about the Afghan's as much as you were about your boss coming down on you… so yeah that was absolutely in my thought process, everything there was about you know trying to prevent bad things from happening, they were less worried about that it seemed to me that they were about accomplishing the mission, so I'm, at this point I'm a major, I'm a field grade officer, I know my Sun Su, and my Clausewitz and things like that, and I know, as they said, all wars political. War is an extension of politics by other means, that the real way you win this war, like Sun Su said is to win the hearts and minds of the people, and so it is frustrating to me, this is a side, unrelated to the decision-making, but it is frustrating to me to be in an environment when they are not interested in engaging with the Afghan people, going out and making tribal alliances, and making friends, they were more worried about "let's not screw anything up." Let's not do anything wrong, right?*

Regarding the latter point, CDMs also highlighted that in several cases decisions were made not because they were perceived as the "best" (or even "least-worst" cause of action) but due to organizational pressures that affected the choices that a Soldier made. Such pressures are,

currently, not featured in any theoretical model of military decision-making. This reinforces the void between our theoretical perspectives of military decision-making (either RPD or MDMP) and the factors that can influence the way military decisions are made on deployment. Or, as one of my interviewees highlighted:

> *The people making the decisions on the doctrine have no idea what they're talking about [laughs] that's my personal opinion. They do not take into account the feedback they get from the field so that's the reason and in theory and in a perfect little word and happy bubble we all want to get it all, make it all like roses and fine and dandy but it's not like that.*

Rumination

One important issue that emerged during this work was also the degree to which the decision maker ruminated on their decision post-hoc. As one interviewee recounts:

> *"I think about this all the time, and I came out without a scratch and it's one of those things those three guys, or four guys, who were wounded almost instantaneously, you think you know, maybe I could've made a different decision? But those are alternate realities"*

Now, to date the literature on Post-Traumatic Stress Disorder (PTSD) has focused on events and tragedies *seen*, what it has not so much focused on in the long-term consequences of the psychological tragedy of having to make critical decisions that involve balancing lives against other moral imperatives. In doing so, it is arguable that there are long-term ramifications on the individual even in those cases where there was not a bad outcome. One interviewee, for example, discussed how he ruminated on his decision "every night", despite the fact that no harm came to anyone. Hence, his trauma was not because of what happened, but it was because of the decision he made, why he made it, and the incongruence that caused between this "real" self and his own

view of how he should act. Others, more in passing, gave small insights into the long-term suffering and negative consequences that have endured as a result of experiencing a certain event and making the decisions they made. As one interviewee outlined:

> *"And erm…so erm…so that's something you know, looking back on it for a number of years and doing some leadership and decision making courses, I don't, I can never understand why I made that choice. You know, I think it was out of desperation and also because you know I had taken some personality tests and I think I'm a very intuitive kind of thinker, maybe more so than I need to be, you know, at times"*

While it is far beyond the scope of this research to begin to understand long-term trauma, or even attempt to bridge the gap between these types of least-worst decisions and PTSD/psychological harm, given the significant prevalence of PTSD and suicide in military samples, it is incumbent upon psychologists (me included) to further explore this link and the role of these decisions on long-term negative health outcomes for Soldiers.

Discussion

This chapter provided empirical support for several assertions made in the early chapters of this thesis. Firstly, that members of the Armed Forces often face least-worst choices, in which they struggle to decide between two equally unattractive options (in this research no one recalled a situation in which they faced two equally good options). Furthermore, as presupposed in Chapter 2, in such situations they were unable to draw on any "library of experiences" because these least-worst decisions were unique. Here then, they were forced to engage in a complicated, and fragile process of choosing between two equally adverse options while still maintaining the ability to behaviorally commit to a choice (i.e., to not become inert). Furthermore, and as argued in Chapter 3, the data collected here supports the importance of several factors, outside the nature of the options available, that can affect the decision-maker. Here then, CDM highlighted the role of

factors that are unlikely to emerge in general interviews, or SBTs, such as organizational pressures. This then further strengthens the relevance of the SAFE-T model that specifically identifies these factors and the negative role they will have on decision-making.

In support of these efforts, this research presents the first glimpse of 13 narrative accounts of least-worst decision-making in war. In analyzing these accounts, I focused on the role of uncertainty (exogenous and endogenous) and accountability as potential factors that can derail decision-making. In recent naturalistic research using a simulated counter-terrorism operation van den Heuvel and colleagues (2012) demonstrated how uncertainty and "save self" priorities (i.e., seeking to avoid being blamed for a wrong decision, rather than making a decision that could result in the best outcome) could derail effective decision-making and introduce inertia into the decision-making process. Here I found early evidence that both these factors also come into play in military contexts. For example, many of my participants highlighted the role of accountability and organizational culture in shaping the types of decisions that they made. In addition to this, I extended the discussion of uncertainty. While in many high-stakes situations uncertainty in the environment is prevalent, here I argued that equally important to consider (and for psychologists to explore) is the role of exogenous uncertainty in the decision-making team. This issue too emphasizes the importance of future work that focusses on the role of the decision-making team in military decision-making, as well as the conflicts that can arise when different members of a team have different priorities and values. These findings, therefore, emphasize the importance of applying on-going research in critical and major incident decision-making to other areas of high-risk decision-making, such as the military.

One very prominent finding from this study is the apparent lack of decision inertia within our Soldier sample. To put this in perspective, in CDM interviews conducted by Power (2016) in which she asked members of the Emergency services to discuss a least-worst decision they had made, she found that they often suffered from decision inertia because they experienced goal conflict (i.e., struggling to choose between two opposing goals). Here, however, while our Soldiers all recalled least-worst decisions, and many identified opposing goals (such as protecting the life of Soldiers vs., protecting civilians or pursuing a known enemy) inertia was a very rare outcome. In fact, only one interviewee (7.29%) exhibited clear evidence of inertia and was unable to commit to a choice of action in time. The remaining 12 interviewees (92.30%) were all able to commit to a choice of action within the required time frame. Many in fact highlighted a very deliberate series

of cognitive ruminations they made to avoid inertia. The following was recalled by a Navy Commander about how he used mental simulation to plan operations in Afghanistan;

> *I call it playing chess, but I try to visualize the chess games, like I do this, what is the reaction? If I do this, what is the reaction? If I do this, what is the worst that can happen? And when I'm [facing these decisions] I am not doing it by myself obviously, I have some field grade officers and helping out with the decision and saying what about this and what about this, and we can do this. And by kind of thinking through that we'll red team it. Try to figure out what is the most likely thing to happen that we had to be prepared for and what is the worst thing that can happen and are we prepared to handle that? And we kind of walk through each of those scenarios, and then just make sure we have some kind of counter-measure to, so, if it is likely that somebody put an IED on the route between here and there, then let's make sure we have route clearance between here and there. Ok, we are likely to be on the ground for 8 hours, ok, well we could become a sitting duck for a sniper so let's put an extra cordon on there. And, oh yeah, 8 hours, you guys are doing to need a latrine to drink water and maybe something to eat because it is going to take us 3 hours to get there and 3 hours back so let's think about some logistics of that stuff. So yeah, so, did I put a mental framework on that, yeah, and I think that started back in the early tours where you try to visualize how this unfolds, you know, …what is the most likely thing that is going to happen, and then um, I think the last thing, at least as a leader is, the last thing you visualize, is what if the worst does happen? What am I going to do about that, what do I have in reserve, who do I call? What if this just goes completely south? What does that mean to me? What are the first 2 or 3 things that I am going to do, because there is not an SOP [standard operating procedure] for that. But it is nice to have thought about that, because then you do not suffer from the paralysis.*

While, on the face of it, this seems problematic for my early hypotheses (namely the exploration of decision inertia in military decision-making) this finding, in fact, offers incredible promise. Specifically, if, as I am arguing here, when faced with least-worst decisions members of

the Armed Forces are resistant to inertia, then the critical question is *why*, when faced with similar situations they outperform their police and Emergency services counterparts. There are, logically, three potential hypotheses that could be forwarded to explain this finding. I elaborate on these below;

1. Individuals who enter the Armed Forces have individual differences in decision-making styles compared to those who do not join the Armed Forces. It is well known that individuals differ in their decision-making styles (e.g., a need to maximize, vs., a willingness to satisfice) and that this correlates with differing ability to avoid decisions (Parker, De Bruin & Fischhoff, 2007).
2. Individuals become more resilient to inertia because of extensive training in decision-making and develop a domain-general ability to make critical time-sensitive decisions.
3. The environment within which decisions are made (namely "at war") alter the degree to which external pressures (such as accountability) are felt, preventing such factors from derailing decision-making. Research from social psychology has extensively shown that individuals are affected by the situation, and often behave in situation-relevant ways (e.g., Zimbardo, 1969). Given this, it is possible that the military environment creates social expectations for swift and decisive action.

Above are three possible explanations for the lack of decision inertia witnessed in the 13 narrative accounts of least-worst decision-making collected here. These three, while currently all under-investigated (if investigated at all) will provide an essential starting point for the experimental research-stage of this thesis. Specifically, each of the three explanations above implies a discrete set of hypotheses that can be tested experimentally. Namely;

1. If we accept hypothesis 1 then Soldiers and members of the Emergency services will significantly differ on several, relevant, personality and decision-making metricizes.
2. If we accept hypothesis 2 then Soldiers will outperform members of the Emergency services in all least-worst situations because of an improved decision-making style

3. If we accept hypothesis 3 then Members of the Emergency services and Soldiers will all be more resistant to inertia when making military decisions vs., making least-worst decisions in a non-military setting.

We test these hypotheses in the latter stages of this thesis (see Chapter 6, 7 and 8).

Methodological Limitations: Post hoc "bolstering"

Given the strong assertions I am making from the narrative data, and the importance of this for the following directions of this thesis, it is important that I outline some of the potential issues with this data. Janis and Mann's (1977) model of decisional conflict argues that when making a decision that involves (potential) unfavorable outcomes decision-makers often "bolster" the perceived benefit of one choice while minimizing the costs of the other. Bolstering involves magnifying the attractiveness of a chosen outcome while playing down the potential losses (Festinger, 1964). Bolstering can also involve diminishing the likely losses from options that were turned down. Bolstering is therefore a dissonance-reducing activity that changes the decision-makers' subjective evaluation of the chosen and unchosen actions, rating the chosen action as more attractive and the unchosen action less so. As such, the decision-maker effectively spreads the alternatives increasing the differentiation of options to a greater degree than they were at that time (Janis & Mann, 1977; p. 82). This "spreading of alternatives" has been shown in both experimental and field studies; showing that after someone has committed to an action they are likely to bias their perception in a way that maintains the spread between alternatives (e.g., Brehm, 1956; Brehm & Cohen, 1962). What this means is that when asking participants to recall a situation in which they specifically had to choose between alternatives that were equally adverse, because they made a choice, they are likely (and to varying degrees) to perhaps bolster their positive perception of the choice that they made and minimize the potential losses that could have occurred from the choices that they did not make. This is an important point to consider given that bolstering has been shown to occur in decisions such as car purchasing (Elrich et al., 1957), and in this research CDM is focused on decisions that are high-risk, adverse, and whose outcomes involve the life, and death, of themselves, fellow Soldiers and members of the civilian populations. Given the high-stakes of such decisions (coupled with the high cost of an error) it is viable to propose that post-decisional

bolstering could be a vital defense mechanism against dissonance and regret. Given the clear methodological constraints of gaining access to members of the military and Emergency services *in extremis* this point puts precedent on efforts of psychologists to increasingly use experimental methodologies to examine least-worst decision-making to remove the opportunity for *post hoc* bolstering and provide a clearer picture of the decision-making strategies that occur during a least-worst decision.

Conclusion

It has been said that war acts as a "laboratory for the human condition in extremis" (New York Times, 2014). Here, analyzing a series of highly detailed narrative accounts of Soldiers' decision-making on deployments in Afghanistan and Iraq I sought to investigate the types of decisions that these individuals faced, and how our wider theories of decision-making can account for the way in which they made these decisions. Several, very interesting, findings emerged from this work. First and foremost, I identified that, in many cases, the decisions that Soldiers' struggle with share many commonalities; "satisfactory" outcomes could not be predicted during the decision-making process; the decisions are (often) non-kinetic, they are novel, they have not trained for these types of decisions before, nor were they particularly expected. This finding cements the importance of the argument levied at theories of decision-making during the early chapters of this thesis. Specifically, theories that focus on experience and choosing the most "satisfactory" alternative fail to explain least-worst decision-making. Furthermore, the ease with which my participants could recall *at least* one least-worst decision highlights that these types of decisions are prevalent, and they warrant further scientific attention. To further this point many participants demonstrated very strong memory traces and often emphasized that they still ruminate on this choice. This issue of rumination is something that I have explored elsewhere (Shortland, Alison & Moran, *forthcoming*) but it reinforces that least-worst decisions, while they only represent a minority of the overall quantity of decisions made by Soldiers are high-stakes and high-consequence and largely defy RPD and traditional theories of decision-making under uncertainty.

Given this then this research sought to specifically investigate cases of choice in a military population. It sought to identify the types of situations that cause choice and conflict and some of the barriers to effective decision-making in these situations. It found that, perhaps contrary to many

expectations, that most least-worst choices that Soldiers' faced were not *in extremis*, but were more often logistical, personnel, or mission planning. This is not to say that the consequences did not involve life or death, but that more often hard choices were not encountered in the field. This perhaps shows the strengths of RPD and doctrine (as intended) in that it means that least-worst decisions are not as prevalent in time-sensitive tactical operations. Despite this, all my interviewees could readily recall a time when they had to make a least-worst decision. Furthermore, they outlined the cognitive conflict that these decisions caused (namely "hesitation, vacillation, feelings of uncertainty, and signs of acute emotional stress." Janis & Mann, 1977, p. 46; see also Tversky & Shafir, 1992). What this research shows is that despite most decisions being well explained by traditional RPD methodologies, least-worst choices exist and require more efforts to document their occurrence and examine the strategies used by decision-makers to navigate them.

Finally, data presented above supports the need for theories of decision-making to not only consider both endogenous and exogenous uncertainty. It is commonplace for the academy, as well as the military, to highlight that decisions in war are made "under a cloud of uncertainty" but often we do not elaborate where that uncertainty stems from, or at the very least, we assume it stems from incomplete information, or a clandestine and unpredictable "enemy". Here exogenous uncertainty was commonly cited; confusion caused by uncertainty about our roles, and the roles of others. Similarly, organizational pressures such as accountability were cited as affecting decision-making. From this, any theory of military decision-making which seeks to describe choice as exclusively an output of an evaluation of options is missing the important influence of these sources of exogenous uncertainty.

Finally, in identifying that, when compared to their Emergency service counterparts, Soldiers displayed a relative lack of inertia, in this chapter I proposed three hypotheses that may explain this finding. Namely that the people are different; there are trained to makes decisions differently; and that the nature of the environment changes alters their decision-making process (namely making them less concerned with negative outcomes and accountability). It is essential then that this qualitative research is followed up with quantitative research that can make a first attempt at exploring this. However, before I engage in any quantitative research I still lack a detailed understanding of the process through which least-worst decisions are made in military samples. Without which, it is both premature and empirically unwise to begin to experimentally test performance and make assertions as to the factors underlying causal differences between

samples. In the next chapter then, I expand upon this study to explain how Soldiers can make least-worst decisions in conflict situations. Specifically, I seek to delve deeper into the process of option selection and how Soldiers evaluate and commit to choices that seem equally adverse and high-risk.

CHAPTER 5: LEAST-WORST MILITARY DECISION-MAKING: A GROUNDED THEORY

Between two foods alike to appetite, and like afar, a free man, I suppose, would starve before of either he would bite.
So would a lamb, between the hungry throes of two fierce wolves, feel equipoise of dread, so hesitate a hound between two does.

- Dante, Divine Comedy, Paradiso 3 (1265 – 1321).

In the previous chapter, I took a detailed look at what military decision-making looks like *in the field*. Through a series of critical decision method interviews I unpacked some of the exogenous and endogenous factors that come into play within the military decision-making process. Furthermore, I looked at the type of decisions that members of the military are required to make finding that, despite the focus on repetition and building a "library of experiences", they are often faced with situations in which they have no "analogous" memory. Furthermore, I identified that in some cases (often those for which they have no analogies) they are required to choose between two options that are equally unattractive, this again creates issues with current theories that focus on "workability" and "satisficing." What the last chapter did then is it resuscitated the importance of choice and the fact that, in certain situations, members of the military are required to choose between options for which they do not know which holds the "ideal" outcome. The question then is, in the absence of recognized-prime and satisficing, how do Soldiers commit to courses of action which is adverse and high-risk? Furthermore, given what we know from similar decisions in critical incidents, how do they commit to courses of action without suffering from decision inertia? In this chapter, I seek to further elaborate on this process. Specifically, I engage in a theoretical deepening by conducting a series of further interviews with members of the Armed Forces and employ a grounded theory approach to understand the psychological process through which Soldiers are, and are not, able to make least-worst decisions in conflict situations.

Do Soldiers Choose?

In conducting the research for the last chapter I came across a perplexing phenomenon in that some members of the Armed Forces often told me that they "did not make any decisions" on their deployment. While originally this was hard to reconcile (they had often been deployed in combat roles and engaged in kinetic activities; yet felt like they made no decisions?), what they are saying is that not that they did not make any decisions, they made many decisions every day. What they are saying is that they never made any *choices*.

In war, many decisions do not specifically require a choice. Actions are either mandated (through a SOP), or have an analogy or preexisting commitment that (at least according to your forecasts, and SA at the time) will work. This assertion is fine, and indeed it is the basis of military training and it really does support the importance of RPD in both training and theory. As Mike Matthews, a Professor at the United States Military Academy West Point, highlights, the continual practice leads to a "library of schema-script connections. As proficiency builds, the Soldier can quickly pattern-match the observed situation with an appropriate script Decision-making in these cases may become virtually automatic." (2013, p. 62). Military decision-making research too follows this trend, focusing on RPD perspectives of how experiences and expertise are applied in the field (e.g., Bryant, 2002; Davison, 2008; Elliott, 2005; Morrison, Kelly & Hutchins, 1996; Pascual & Henderson, 1997; Ross, Klein, Thunholm, Schmitt & Baxter, 2004; just to name a few). Previous experiences, a wealth of training and Standard Operating Procedures (SOPs) therefore combine to allow the Soldier, in many conditions, to act without deliberating between options, but by choosing one solution (experience, or SOP-based) and acting. This is the RPD model. However, it is very clear that when there are competing goals or multiple options Soldiers will have to choose. Perhaps one of my interviewees from the last chapter phrased it best:

> *I always fear making a wrong decision, especially in a deliberate process like that this. In terms of a right or wrong decision if it is time critical and I have got make a decision or else I'm going to die or somebody else is going to die, those decisions get made very easily and there's no real thinking about it in the time that you have. Here, in the 5 hours that I had to dither and ruminate and the number of "what ifs" and "if I make this decision this is what's gonna happen" the number of scenarios*

> *that I was able to go through in my own mind were significant enough to where I did feel that making the wrong decision was going to end up in mission failure and in my own loss of credibility to in the eyes of my commander, in the eyes of my soul, and my air men and my folks that rely upon me to make those right decisions, and so I would be lying to say that…my thinking about making the right or wrong decision didn't affect me making the ultimate decision. But with the amount of time that I had and the amount of time that I had to ruminate on the decision I did feel like I made the right decision and I feel like when everybody looks from the outside that the ends achieved, that that was the right decision to do it so I wouldn't necessarily say that making the wrong decision was necessarily something that I really thought about umm…But what I did do was I stressed heavily about the idea that I needed to make the decision that was going to result in mission success versus a decision that was going to result in mission failure umm…Again accepting the risks that were going to be accepted after that decision which is again why you have the two critical options between bad and not so bad type decision-making.*

Thus, despite the prevalence of RPD (both in the real-world and training), I hold that Soldiers are required to make choices. They will have to evaluate options and choose an alternative based on consequence. Furthermore, from my own observations and research, I know that making such choices is often a demanding task given the nature of modern warfare and the operating environment they make such choices within. If our focus remains on RPD and efforts to train Soldiers continue to focus solely on decision-making without choice when they face a situation that requires choice (because of the parameters set out by Cohen & Lipshitz, 2011) they may be totally ill-equipped to do so. This point cannot be emphasized enough.

A Trimodal Theory of Decision-Making

Perhaps, perplexingly, this apparent paradox between the degree to which decision-making involves a choice is related to the fact that decision-making is so often viewed as "selecting the best of multiple options by deliberating about consequences." (Cohen & Lipshitz, 2011). A decision is conventionally defined, for example by Jeffrey (1965/1983), as a *choice* between two

or more options, which is based on reasoning regarding the desirability of each one. However, if a decision does not necessarily involve choice, then what does it involve? The avid reader will remember that in Chapter 1 I defined a decision as a *commitment* to a course of action. This is in line with Yates, Veinott, and Patalano (2003). Cohen and Lipshitz (2011) expanded on this idea of decisions as a commitment in that they defined a decision as "*graded commitments of mental, affective or material resources to courses of action.* Decision-making includes any *cognitive process* that can create, reject, or modify such commitments – regardless of the cognitive resources it may or may not consume in doing so (p. 4; italics are the original authors'). Drawing upon Bratman's (1978) work on intentions, plans and reason, Cohen and Lipshitz define a decision as an intention or commitment; which in term reflected a set of dispositions;

> (a) to stop looking for or thinking seriously about alternatives (unless the situation changes and the choice needs to be re-assessed)
> (b) to seek out aspects of the situation that are specifically relevant to the implementation of the chosen course of action
> (c) to plan the course of action in more detail
> (d) to take preparatory steps to implement that course of action (e.g., allocating resources, rehearsing, or enlisting others' cooperation)
> (e) to experience a negative affect if the chosen course of action is blocked;
> (f) to execute the chosen course of action at a suitable time and place

The importance of viewing *choice* as *commitment* is that decision-making does not start from scratch. Instead, each decision is affected by the agents' pre-existing commitments (Bratman, 1987), which in turn shape new intentions or generate immediate action (Cohen & Lipshitz, 2011). This is not a surprising revelation given that experimental research has long-shown that committed decision-makers are reluctant to change their minds (the sunk cost fallacy: Arkes & Ayton, 1999), they ignore and distort information to match their currently-held views (confirmation bias: Wason, 1968; Nisbett & Ross, 1980; Poletiek, 2001), and even deepen their commitment in the face of negative feedback (escalation of commitment: Staw, 1976; Staw & Ross, 1989).

A decision is therefore the combination of both existing commitments, long-term knowledge, and current information. Thus, any eventual plan that is developed is the result of

multiple, dynamic, decision cycles rather than the output of a discrete choice stage (Cohen & Lipshitz, 2011). Cohen and Lipshitz (2011) propose these three forms of commitment change as unique modes of decision-making, each of which is associated with a qualitatively distinctive phenomenology of thinking and acting, as well as differences in the ways in which actions are chosen and justified. In the first instance; one in which a decision-maker has no prior commitments; they will engage in a process of *Matching* that is they will ask "What should a person in my role do in a situation of this kind?" (see March, 1994, p. 58). In these situations choices can often be dictated by rules or norms that can stem from a range of sources including; social norms (Bicchieri, 2005; Bicchieri, Jeffrey, & Skyrms, 2009), organizational routines (Levitt & March, 1988), standard operating procedures and best practices (Betsch & Haberstroh, 2004), previous cases and precedents (Schank, 1990, 1999; Kolodner, 1993), religious doctrine (Atran, 2002), and moral principles and political ideologies (Thompson, Ellis, & Waldavsky, 1990). Matching thus generates intentions and actions without choice; because the choice is dictated by practice or rules. These rules usually do not present multiple, exclusive courses of action and more frequently form an "If A then B" model. Meaning that if the situation is perceived as "A" then "B" follows without much choice or competition. While this sounds relatively mundane (merely following doctrine or policy) the importance of this tactic should not be underestimated and it can be relied upon to solve incredibly high-risk complex dilemmas.

The second form of decision-making is *Reassessment* in which "the decision-maker monitors for, or actively probes for, problems with an intended action (i.e., Rebuttals to previous arguments), in response to the implicit or explicit question, "*Is my course of action reliable?*" (Cohen & Lipshitz, 2011, p. 10). This question can be answered by mental rumination of the outcomes of a preference (either through story-telling or mental simulation; Cohen et al., 1996; Endsley & Garland, 2000; Pennington & Hastie, 1993). Reassessment and matching are deeply connected. As Cohen and Lipshitz (2011) argue "While matching seeks to maximize the number of truths, reassessment seeks to minimize the number of errors. Thus, matching seals commitments and reassessment unlocks them…. Matching and reassessment are both necessary: one to generate commitments based on accumulated knowledge and the other to vet commitments and stimulate improvements, which are then used in future matching." (p. 15). Furthermore, while both differ in the etiology of the choice, they are both single selection in that options are (either generated or evaluated) sequentially and one-at-a-time. Thus, Reassessment closely represents the common

RPD model of decision-making under conditions of risk and uncertainty in that they center on the "workability" of a situation and accepting (or rejecting) the feasibility of an option that usually appears to the decision-maker quickly and based on prior experience.

The final form of commitment change is *Choice*. It begins with the commitment to choose one course of action, and centers on the question "Which of these options is the best means to my ends?" (Cohen & Lipshitz, 2011, p. 11). This form of choice is centered on maximizing expected desirability of future states and requires a shift in commitment from being equally dispersed across to disjunctive options to one option. Selection should further be justified (i.e., Do A because it is the most effective means to my end). This normative form of rationalization is what Simon called objective (1956) or substantive (Simon, 1976) rationality and was outlined in detail in Chapter 2. And while in Chapter 2 I highlighted the many issues with assuming "rationality" in an economic decision-making model; I do not disagree that in some cases the decision-maker is forced to weigh the pros and cons of multiple options. Furthermore, most criticisms launched at rational-choice perspectives do so because it viewed that it was "how humans made decisions," rather than a slightly more muted view that it is a "strategy" that humans adopt in a certain situation. As Cohen and Lipshitz (2011) argue decisions require choice (rather than matching or reassessment) when;

> (a) The environment presents multiple options
> (b) An external pressure (organizational or cultural) requires you to justify your action by comparing it to another option
> (c) The goals of the decision-maker compete with one another, and advantages and disadvantages must be traded off to approach optimality.

It is telling that these three requirements are the exact same that the founders of RPD state mean that recognition-prime is not sufficient (Klein, 1998). Thus, I have arrived at come clarity; and at the same time added some clarity to our earlier discussions about the applicability of RPD decision-making in cases of high-uncertainty and no–previous experience and rational comparative models in situations in which fast action is required. At the same time, I have fleshed out the choice strategy that it likely to accompany to underpin decision inertia and least-worst decision-making. As we have seen above; there are various forms of "choosing" a course of action and these range from a highly simplistic "what should I do given the role I have," to a more

elaborate "will plan X work?" Both of these closely resemble the wealth of literature on decision-making in conditions of uncertainty in that it does often denigrate choice. To quote Klein's (1989) article in Military Review again:

> The culprit is an ideal of analytical decision-making which asserts that we must always generate options systematically, identify criteria for evaluating these options, assign weights to the evaluation criteria, rate each option on each criterion and tabulate the scores to find the best option. We call this a model of concurrent option comparison, the idea being that the decision-maker deliberates about several options concurrently. The technical term is multiattribute utility analysis.
>
> Another analytical ideal is decision analysis, a technique for evaluating an option as in a chess game. The decision-maker looks at a branching tree of responses and counter- responses and estimates the probability and utility of each possible future state to calculate maximum and minimum outcomes. Both of these methods, multiattribute utility analysis and decision analysis, have been used to build decision training programs and auto- mated decision aids
>
> These strategies sound good, but in practice, they are often disappointing. They do not work under time pressure because they take too long. Even when there is enough time, they require much work and lack flexibility for handling rapidly changing field conditions. (p. 56)

And from this assertion the field (and research focused on military decision-making) increasing began to fore-go the idea of "choice" and "comparison" focusing instead on how members of the military make fast decisions, based on experience, so that they can then train the decision-makers to make decisions quickly (and without using too many cognitive resources) in the field when required. And this was reflected in some of the interviews presented in the last chapter (usually when they contrasted the "hard" decision they were discussing with the "easy" ones they had faced before):

> *You know what kept what makes situations like this easy is again the very boring answer of repetitive training we worked you know worked very hard at home station*

> *to make sure that red and white were always very comfortable to pass in and out of each-others rings we worked very hard to be comfortable task organizing on the fly so even just fighting as red and white together but then also as hunter-killer teams like two Bradleys and a tank working together so that was something we really prided ourselves on you know the ability to task organize on the fly with you know little umm little issues or anything*

But this is only one strategy that can be used; and it only works when the decision-maker has already established *commitment* to a course of action that they can *apply*. As I argued in Chapter 2 then, this strategy of choice has little utility in cases that we have not experienced. In addition, the other form of choice "matching" is equally relevant to the military given the significant investment in developing (and updating) Standard Operating Procedures (SOPs). Even though SOPs are viewed as "too rigid" they do proceduralize decision-making, allowing the decision-maker to answer "what should someone in my role do in this situation." (Pascual & Henderson, 1997). However, even this is not sufficient to accommodate the plethora of situations members of the military find themselves having to make decision in. In the interviews from the previous chapter, as I talked with Soldiers' about the decisions they faced, they often discussed the role of Standard Operating Procedures (SOPs; and hence their ability to "match") and more often than not the SOPs either 1; didn't apply, 2: didn't exist for this type of situation, or 3; SOPs helped with procedural aspects of the decision-making (e.g., how large a delegation should I take out to provide security for a mission) yet crucially didn't help with the *actual* decision (should I go out on this mission or not?). As one of my interviewees from the last chapter explains:

> *The SOPs that we used were probably the risk mitigation measures, setting up the cordons, that would have been a SOP for anything, but for an infantry unit to go in and do some operations. Having the air coverage was probably a SOP, the movement out there was a SOP, but as far as the recovery and stuff that was kind of a new, like I said, because of the size and location, that where we really relied on the experience of the Non-Commissioned officers and the subject matter experts to figure out how they were going to solve the enigma of getting that out of there. Getting in there, clearing the area and securing the area and getting back out was*

> *all, we used SOPs for them, that is stuff that they have all been trained on before, they knew. The communications were pretty standard. I would say a lot of it was SOP, uh, the uh, decision to get in there, the decision was different, and then the actions on site kind of had to be improvised and adapted to fit.*

Thus, and perhaps this is an over simplification, in war easy decisions do not require choice; it is either mandated (through a SOP) or you have an analogy or preexisting commitment that (at least according to your forecasts, and SA at the time) will work. The issue, however, is that attempting to develop a Soldier that makes decisions without deciding you do not train a Soldier who is able to decide when they cannot pattern match nor do their experiences suffice. This is a fundamental issue with RPD and associated perspectives, and one that is continually at the fore when we discover inertia; an inability to decide. By denigrating the idea that decisions involve choices (even if this is a rare occurrence in respect to the total number of decisions that are made) and trying to train Soldiers to make decisions without having to choose; when they face a situation that does require choice (because of the parameters set out by Cohen & Lipshitz, 2011) they may be totally ill-equipped to do so.

Choice and Conflict

A choice is the emergent outcome of weighing and summing outcomes and making tradeoffs about utilities. Yet choice breeds tradeoff and tradeoffs result in conflict because "the decision-makers must accept less of one choice attribute to get more of another" (Luce, Payne, & Bettman, 2001, p.86). As Tversky and Shafir (1992, p. 358) wryly note the "experience of conflict is the price one pays for the freedom to choose". In decision-making, conflict has no formal definition but the most commonly held view is that it involves "preference uncertainty" (see Dhar, 1997; Fischer, Jia, & Luce, 2000; Shafir et al., 1993). Hence, when a decision involves multiple options conflict refers to the uncertainty about which option is more valuable (Fischer, Jia & Luce, 2000; Fischer, Luce & Jia, 2000).

Conflict is an aversive experience and people are motivated to avoid it (Lewin, 1951; Houston, Sherman, & Baker, 1991; Shepard, 1964) and experiencing conflict can have both behavioral (e.g. longer choice times) and mental outcomes (e.g. lower confidence). Participants in

experimental studies preferentially select a "no-choice" option when the choices generate conflict (Dhar, 1997; Dhar & Nowlis, 1999). Under conditions of conflict, decision-makers take more time (e.g., Fischer et al., 2000); report increased decision difficulty (Scholten, 2002; Scholten & Sherman, 2006); have lower confidence in their choice (Zakay, 1985; Zakay & Tsal, 1993); are more likely to defer the choice (Dhar, 1996, 1997; Dhar & Nowlis, 1999; Dhar & Simonson, 2003); and have an increased number of thoughts, or justifications used for each option (Dhar, 1997). In Alison's research (e.g., Alison & Crego, 2008; Alison et al., 2013; 2015), conflict was often accompanied by an increased experience of negative affect while when deciding.

The degree of conflict one experiences is related to the size of the tradeoffs between the attributes that one must make (Scholten, 2002; Shafir, Simonson & Tversky, 1993; Simonson & Tversky, 1992; Tversky & Simonson, 1993) and we experience a sense of conflict when we must make both large and small tradeoffs in decisions (Festinger, 1964; Scholten & Sherman, 2006). To give you a sense of high and low tradeoff conflict let us consider, for example, a hostage dilemma that was posed to me (N. Shortland) by my Ph.D. supervisor (Prof. Alison) during one of our (many) Ph.D. sessions:

Imagine you are a commanding officer and have arrived at the scene of a hostage siege at a local junior school (the students are aged between 5 and 12). You have received intelligence that while most teachers and pupils have been able to escape the school and are safe in the car park there are two rooms in which hostages are being held. Intelligence suggests that each room contains one hostage taker. In the first room, from what you can gather, the hostages include two children (aged 8 and 11) and an elderly teacher. In the second room, the hostages are three children (aged 6, 8 and 12). From your assessments, you can launch a raid on one of the two rooms or split your men to launch simultaneous raids on both rooms. Launching a raid on a single room will likely result in the successful rescue of the children inside, but will also very likely cause the death of the hostages in the second room. Splitting your forces would create a much lower chance of successfully rescuing the hostages in each room.

In this scenario, there are both small and large tradeoffs to be made; all of which induce conflict. For example, if you decide to split your forces and launch a simultaneous raid you would be trading away the likelihood of success, but avoiding the conflict associated with choosing between rooms. This is, clearly, a large-tradeoff that requires a high degree of sacrifice. On the other hand, if you decide that you do want to launch a raid on only one of the rooms then you are faced with deciding which room to target. Both rooms have three people inside, hence the tradeoff is relatively low, yet conflict still emerges.

Conflict, therefore, occurs in both high and low tradeoff decisions because, in high tradeoff situations, conflict arises from the *sacrifices* that must be made, while in the low tradeoff situations, conflict emerges from having to find a strong *argument* between two similar options (Scholten & Sherman, 2006). Regarding the hostage scenario above: in the decision to target a single room sacrifice is high (i.e., you are potentially condemning the second room to death) but argumentation is low (you have a strong argument in that you can guarantee with greater confidence that you will rescue at least 3 hostages). Having made that choice, then deciding which room to target leads to low sacrifice and high argumentation (i.e., it is very hard to argue between the value of lives; two children and one adult vs., three children).

Scholten and Sherman (2006) formalized this relationship between argumentation and sacrifice in their double-mediation model of conflict, within which, for any decision, there are two sources of conflict: the first is a concern about sacrifice, and the second is a concern about argumentation. In Scholten and Sherman's double-mediation model they propose two important hypotheses. The first, which I showed above, is that both high and low tradeoffs cause conflict. The second, and perhaps more important hypothesis is that "when one attribute is much more important that the other (very unequal attribute importance), the relation between tradeoff size and conflict will change in an upward direction, more specifically, the inverse U-shaped relation will change into a (more) positive relation" (2006, p. 243). Thus, the degree of conflict experienced emerges from three pressures:

1. The degree of **sacrifice** incurred by selecting one option
2. The ability to **argument** and justify a choice
3. An independent metric of attribute **importance**.

As they outlined in their model (and empirically tested in the lab), when one attribute is valued as much more important than others, the amount of conflict is "differentially weighted," meaning that the degree of experience experienced from sacrifices and argumentation are not equal, but mediated by the degree of preference we have for a given choice. The double-mediation model ideally integrates with our naturalistic research with decision-makers who become inert, and those (namely members of the Armed Forces) who do not.

In her Ph.D. thesis on decision inertia in critical incident decision-making, Power conducted a series of critical decision method interviews (like those I used here) with members of the "blue light" services (that is Police Service, Fire and Rescue Service, Ambulance Services). Her work with Prof. Alison (which has fed into a lot of my own work on the military) focused on exploring how different goals facilitate action (and under what conditions these goals inhibit action). As Power outlined, while approach goals influence tendencies to take positive action towards a positive stimulus, avoidance goals encourage individuals to avoid negative effects by moving away from a negative stimulus (Elliot, 2006; Elliot, Eder & Harmon-Jones, 2013; Gray & McNaughton, 2000). Power interviewed 31 command level decision-makers from the Police Service, Fire and Rescue Service, and the Ambulance Service (AS). As with my own experimental method, participants in her research were asked to recall a *"difficult decision"* that they had responded to in the past. Power found that emergency commanders held two overarching goals:

(i) Save life: Goals and motivations associated with *approaching* positive outcomes from a situation

(ii) Prevent further harm: Goals and motivations associated with *avoiding* anticipated negative consequences.

However, Power's research found that these (competing) goals often resulted in uncertainty, goal conflict, passive and active avoidance, and inaction. In her own words "The 'save life' goal appeared to derail action if the decision-maker experienced goal conflict by trading it off against the competing avoidant goal to 'prevent further harm'" (Power, 2016, p. 96). In terms of the double-mediation model of conflict, Emergency service responders experienced significant conflict because they were unable to tradeoff between the goal to save life and to avoid further

harm. They had no preference. As one of her interviewees recalled; “what you have to avoid is delaying making your decision about anything which then leads to somebody getting hurt but by the same token you don’t want to knee-jerk and rush into a decision that is not properly considered” (p. 96). Thus, because the service personnel viewed these goals as equal (and hence competing) they experienced significant conflict and, accordingly, experienced decision inertia in terms of decision avoidance. This work together then implies that the ability to commit to choices in least-worst decisions is centered on the ability of a decision-maker to argument and sacrifice between the available options, and when, as shown in Power’s research, they are unable to argument and sacrifice, they become inert and struggle to commit to a decision.

This Study

In the previous chapter, I identified the types of decisions faced by members of the Armed Forces, their inability to identify and apply analogies to these situations, and some of the general barriers to decision-making that are present in the military decision-making environment. What the last chapter did not do (and what neither MDMP nor RPD satisfactorily do) is explain how individuals choose between equally unappealing courses of action. This is an especially important element of this thesis given that the last chapter shows that members of the Armed Forces show an increased ability or readiness to make such decisions. This puts a premium on the need to understand the psychological process through which they make these decisions. Given this, in this chapter, I develop a grounded theory of military decision-making. Specifically, I develop a theory of how members of the Armed Forces decide between equally adverse courses of action. Given that there is little empirical research in this area grounded theory is the appropriate research methodology to employ (rather than discourse analysis or qualitative content analysis; see Starks & Trinidad, 2007).

Method

Grounded Theory

Grounded theory is a general methodology that is used to systematically develop theories that are emergent from, and grounded in, data (Glaser & Strauss, 1967). The theory itself evolves during the research and is the outcome of a dyadic data-collection-analysis process (Strauss & Corbin, 1994). Glaser and Strauss originally proposed grounded theory in 1967 as a practical method by which you can conduct research that focuses on the interpretive process by analyzing the "actual production of meanings and concepts used by social actors in real settings" (Gephart, 2004, p. 457). Hence, in their view (and in stark contrast to the current emphasis for impartial external evaluators in science), a theory could be developed by exploring the interpretations of daily realities by those who were experiencing them (Glaser & Strauss, 1967, p. 239). Hence, grounded theory is therefore a rejection of positivistic notions of falsification and hypothesis testing (Suddaby, 2006). Most significantly, grounded theory offers "a compromise between extreme empiricism and complete relativism by articulating a middle ground in which systematic data collection could be used to develop theories that address the interpretive realities of actors in social settings." (Suddaby, 2006, p. 634). What separates grounded theory from other forms of qualitative analysis using the same data (interviews, observations, historical reports etc.,) is the unwavering focus developing substantive theory. As defined by the Grounded Theory Institute, run by one of the grounded theory founders (Glaser) grounded theory is defined as follows (Grounded Theory Institute, 2013):

> Grounded Theory is an inductive methodology. Although many call Grounded Theory a qualitative method, it is not. It is a general method. It is the systematic generation of theory from systematic research. It is a set of rigorous research procedures leading to the emergence of conceptual categories.

Grounded theory, as outlined by Glaser and Strauss (1967) features two central components; constant comparison and theoretical sampling. Constant comparison (as noted above) emphasizes the fact that data collection and analysis co-occur and interplay with each other.

Theoretical sampling is the process by which the collected data dictate the direction of future data collection, in accord with the theory that is being developed. And, while a common misconception is that grounded theory must begin with a complete absence of theory (indeed the research should abstain from developing any insight into the area, incase this taints or directs their analysis; see Suddaby, 2006) theory can be modified, elaborated and generated through a grounded theory approach (Strauss & Corbin, 1994, p. 273). As a precursor for this grounded theory the 13 narrative accounts collected in Chapter 4 were re-analyzed using grounded theory methodology.

Theoretical Sampling

What emerged from the grounded theory of the original narratives was a series of propositions surrounding the way in which individuals evaluated choice and the subjective nature through which different choices were evaluated by the individual. Specifically, what emerged organically from these first 13 narratives were references to individual "value systems" that were at play and being used to direct action. However, despite the many references to values (both direct e.g., "I valued X" and coded through researcher interpretation "It was more important to me that we did Y") this alone was insufficient to develop a series of axial and theoretical codes because, alone, the role of values had not reached the level of theoretical saturation (Glaser & Strauss, 1967). Given this, I engaged in a process of theoretical sampling to further explore the role of value systems as they pertain to choice in military decision-making.

Theoretical sampling is the second core principal in grounded theory. Theoretical sampling cannot be planned before embarking on, and analyzing data from, the grounded theory study (Strauss & Corbin, 1990, p. 192). During the initial data collection stages many codes may emerge, some of which are more important to the propositions of the theory than others. Given this, and to fully explore the axial relationships between codes further data collection is often needed to deepen the researchers understanding of certain categories until these categories reach, what Glaser and Strauss (1967) call, "theoretical saturation" in which;

> ... no additional data are being found whereby the (researcher) can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated ... when one

> category is saturated, nothing remains but to go on to new groups for data on other categories, and attempt to saturate these categories also. (p. 65.)

Theoretical sampling then is the process through which data collection evolves as directed by an evolving theory and is a pivotal strategy in grounded theory methodology as it ensures that theories are based on a full exploration of the categories involved (Charmaz, 2000; Strauss, 1987). As Glaser (1978) outlines, theoretical sampling is the process in which "the analyst jointly collects, codes, and analyzes his data and decides what data to collect next and where to find them, to develop his theory as it emerges" (p. 36). In lay man's terms, theoretical sampling occurs once the researcher begins to develop an idea of what is occurring, and alters his/her methodology to collect more detailed data on a given category or aspect of their area of study. As Strauss (1987) highlights, theoretical sampling "involves . . . much calculation and imagination on the part of the analysts . . ." (p. 39).

Despite the central importance of theoretical sampling to grounded theory, there is surprisingly little systematic guidance on the process (Draucker, Martsolf, Ross & Rusk, 2007). For example, as identified by Draucker et al. (2007), research that has claimed to have used theoretical sampling ranged from choosing participants with certain backgrounds to modifying their data collection practices. One study (Wilson, Hutchinson & Holzemer, 2002) even changed the entire direction of their study via theoretical sampling. Despite this variety in the specific method of theoretical sampling, it remains one of the fundamental hallmarks of grounded theory. Here I adopted the theoretical sampling method used by Caron & Bowers (2003) in that after conducting a series of preliminary interviews (see Chapter 4) I identified an area of interest (value systems) and added questions to my interview guide to explore this topic.

Participants

For the first stages of the grounded theory, the narrative accounts collected through the Critical Decision Method (CDM) were used to support this study. However, for the theoretical sampling, a further 14 members of the Armed Forces were recruited and interviewed. Because the increasing interest was not on a specific *type* of decision, as in Chapter 4, individuals were not restricted by their length of service, rank or role.

Critical Decision Method

For the theoretical sampling, I used the same CDM method and structure outlined in Chapter 4. The only alteration in the 14 additional interviews was that during the third sweep (deepening) a series of probes were included that specifically sought to identify the underlying value systems at play during the decision-maker. If relevant the underlying origins of these values were also discussed. The updated series of deepening probes used for these 14 interviews are included in Table 5.

Topic	**Cues**
Information	What were you hearing/thinking/noticing during this situation?
	What information did you use in making a decision or judgment?
	How and where did you get this information, and from whom?
	What did you do with this information?
	Did you discard any information that you received?
Analogs	Did this situation remind you of any previous experiences you have had?
Standard Operating Procedures	What were the parallels you drew between the situation and others?
	Did this case fit a standard scenario?
	Is this the type of event you were trained to deal with?
Goals and Priorities	What were your specific goals and objectives at this time?
	What was the most important thing for you to accomplish at this point?
Value systems	*What values were you rely on when making these decisions?*
	Which of these values were you willing to sacrifice against?
	Why, to you, is this value so important?
Options	What other courses of action were considered?
	What courses of action were not considered, and why?
	Was there a rule that you were following in choosing this option?
Experience	What specific training or experience was necessary or helpful in making this decision?
Assessment	If you were asked to describe the situation to someone else at that point, how would you describe it?
Mental models	Did you imagine the possible consequences of this/these action(s)?

	Did you create some sort of picture in your head?
	Did you imagine the events and how they would unfold?
	How close was your imagined outcome to the actual outcome?
Decision-making	What let you know that this was the right thing to do at this point in the incident?
	How much time pressure was involved in making this decision?
	Did you think about it for too long?
	Were you ever worried about the time it was taking to make the decision?
	How long did it take to actually make this decision?
Guidance	Did you seek any guidance at this (or any) point in the decision?
	How did you know to trust the guidance you got?
Feelings	How did making this decision-make you feel?
	How did you feel about potentially making the wrong choice?

Table 5: CDM probes used to explore participants' decision-making strategies with a special emphasis on value systems (*italics represent new questions*).

Data Analysis

As proposed originally by Glaser and Strauss (1967), grounded theory involves constant comparative analysis consists of "explicit coding and analytic procedures" (p. 102). This, they advise should be conducted by following four procedures steps of data analysis:

1) comparing incidents applicable to each category,
2) integrating categories and their properties,
3) delimiting the theory, and
4) writing the theory (p. 105).

In constructing the categories and theory, grounded theory relies on three central elements; concepts, categories, and propositions. Concepts are the basic unit of analysis (like "codes" in

thematic analysis). They are not units of data per se, but basic units of analysis which emerge from the data. As Corbin & Strauss (1990) highlight;

> Theories can't be built with actual incidents or activities as observed or reported; that is, from "raw data." The incidents, events, happenings are taken as, or analyzed as, potential indicators of phenomena, which are thereby given conceptual labels. If a respondent says to the researcher, "Each day I spread my activities over the morning, resting between shaving and bathing," then the researcher might label this phenomenon as "pacing." As the researcher encounters other incidents, and when after comparison to the first, they appear to resemble the same phenomena, then these, too, can be labelled as "pacing." Only by comparing incidents and naming like phenomena with the same term can the theorist accumulate the basic units for theory. (p. 7).

Hence, concepts must be abstract from time, space and the original event from which they came (Glaser, 2002). In Glaser's (2002) view, concepts must also have the power to "enduring grab." As he argues concepts must "instantly sensitize people, rightly or wrongly, to seeing a pattern in an event or happening that makes them feel they understand with "know how". In a word, the person feels like he or she can explain what they see." (p. 30). Coding in grounded theory is therefore the process of both labelling concepts categorizing them into groups of similar phenomena (Corbin & Strauss, 1990). Coding, then, is the "pivotal link between collecting data and developing an emergent theory to explain these data" within which the researcher finds meaning within the data and a theory begins to emerge (Charmaz, 2006, p. 46). With the evolution of grounded theory, several different forms of coding have been proposed (most notably the split in methods between the founders of Grounded Theory; Strauss and Glaser). Glaser (1978) suggests that there are two stages of coding, one "substantive" and the other "theoretical". Corbin and Strauss (1990) suggested three stages of coding: open, axial and selective. Charmaz (2006) has since also proposed three stages of coding: initial, focused, and theoretical. What all models, arguably, reflect is a gradual increase in coding specificity from *a priori* open coding of the material thorough to attempting to discern the theoretical relationship between the codes. In Corbin and Strauss' coding model open coding is "the interpretive process by which data are broken down

analytically" (Corbin & Strauss, 1990, p. 12), axial coding explores the relationship amongst codes and, finally, selective coding is the process through which researchers generate stories that can link one or more categories. These selective codes then form the basis of the theoretical propositions (Corbin & Strauss, 1990; see also Cho & Lee, 2014). While it is clear the coding and data collection process occurred in parallel (e.g., open codes of "values" guiding new interview questions and further sampling) the analysis pattern employed here broadly reflects this original method proposed by Glaser and Strauss (1967). Here I employed the three-stage coding strategy forwarded by Corbin and Strauss (1990).

Results

A Grounded Theory of Military Decision-making

In Power's work (outlined above), members of the blue light services encountered decision inertia when they were required to make a tradeoff between approach and avoidance goals; both of which were equally important to them. In military situations, while competing goals are common, goal conflict was far less prevalent. In my research while Soldiers' often highlighted clashing goals, this rarely resulted in inertia. Through grounded theory analysis of their narratives, and theoretical sampling around the value systems, I identified an early theory of how Soldiers, under conditions of goal conflict, could commit to choices that have potentially intolerable outcomes. At the heart of this theory, and in line with the work above on argumentation and sacrifice, I identified the central role of attribute differentiation; that is, despite all options having the potential to be adverse, Soldiers have a strong sense of attribute differentiation when choosing between least-worst decisions. In the qualitative data collected above Soldiers consistently demonstrated a strong degree of attribute differentiation between different goals (meaning that they often had a strong goal hierarchy) and when making least-worst decisions, they often would not make a sacrifice on a single prominent attribute. What this means is that while the importance of the goals may have been equal (meaning they would be in conflict), the Soldiers were still able to draw a dissociation between the two choices, allowing a decision to be made.

What emerged in this work, and what I engaged in further sampling to investigate was the role of individual values in the way different choices are argued and sacrifices are made.

Specifically, one finding that could be viewed as central to the theory developed here (but there are exceptions, as stated below) was that Soldiers often refused to make any sacrifices regarding the safety of the men and women under their command. For example, when deciding if and how to recover a large military asset currently burning in a local village, one interviewee highlights the importance of force protection:

> *I think um If I was to prioritize* [my goals], *it would be to protect the lives of* U.S. *Armed Forces, I don't want to be skittish and afraid to do our mission, but I certainly didn't want to waste lives, or put them unduly at risk. We had spent a lot of money to mitigate risk and injury and death, and this was about recovering a piece of equipment, and I put that below Soldier safety. If I would have known the outcome of that would have been the death of 2 Soldiers, I would have said it was not worth it.*

On the reverse side, his decision-making would have been completely different had there been military personnel at risk:

> *If I had personnel out there with it. I mean to say that the truck that they were hauling on was you know, say there was some personnel trapped out there. And then those are the times when you know you have to go, and you put people at risk to go, and we've been through that a lot of times when people get hit by an IED and there are folks trapped in the vehicle and then you just go, you don't think about it, you don't feel like you have a choice to just leave people out there.*

His decision-making, therefore, flips on the entirety of this single value. In a similar vein, another participant highlights the importance of force protection when deciding how to proceed with the convoy:

> *Of course, protection is number one, make sure everyone gets back in one piece, hence we have a lot better chance in the firefight. I guess everyone in the country has control, and we have a squad that has more fire power than one of the most fire*

> *powered squads in the military so the special forces or what…. our job is personal security detail, we are there to make sure an officer made it back and that was our primary objective, everything else was secondary.*

A Captain I interviewed from the U.S. Army shared a similar sentiment:

> *I mean the idea is the way I saw it, and the, it is, you know, I, uh, before every deployment I talk with parents and, you know, my mission is to do my best to bring every one of their sons' home.*

As one of my interviewees highlighted; the need to protect all your Soldiers stays even though it often clashes with more mission-focused objectives.

> *You don't want your squadron commander to yell at you. So, you don't want that. So, I mean that was of course in the back of my mind, you don't want to fail your mission and then again you don't want to lose all of* [vehicles] *so that was a stressor. So, you didn't want to fail your mission… certainly didn't want to lose a Soldier*

Thus, despite the many goals in military decision-making (protecting the population, protecting forces, achieving the mission), perhaps one of my Marine interviewees sums it up best when, while pursuing a high-ranking member of Al-Qa'ida in Iraq, he maintains that force protection was his number one priority:

> *Targeting this insurgent was an incredible, great, opportunity, we have never had an opportunity like this before to get some bad guys that have put up a fight. But my goals were; (1) Protection of own force; (2) Killing bad guys; (3) Protecting population.*

The importance placed on looking after your fellow Soldiers is not surprising: it is commonly known to any lay person that this strong social bond between Soldiers is a vital protective factor

with the stressors placed upon them during war. In Leonard Wong and colleagues' (2003) study on how Soldiers were motivated to "continue in battle, to face extreme danger, and to risk their lives in accomplishing the mission" they found that "U.S. Soldiers', much like Soldiers of the past, fight for each other." Thus, today's Soldier is like their WWII counterparts, for whom, as S. L. A. Marshall (1942) noted in *Men Against Fire*, "I hold it to be one of the simplest truths that the thing which enables an infantry Soldier to keep going with his weapons is the near presence or presumed presence of a comrade… he is sustained by his fellows primarily." He continued "men do not fight for a cause but because they do not want to let their comrades down." What this implies is the psychological coping benefits of protecting one's troops; such a strong group-tie has psychological consequences for how Soldiers can handle conflict and navigate least-worst decisions.

Here then, my theory centers not on the evaluation of multiple attributes (as with multi-attribute decision-making, discussed in detail in Chapter 2), but with all options being evaluated on a single value to which complete priority is given. However, what separates my theory from the theoretical regression of single-attribute decision-making is the source of the value itself. In military decision-making, the single value used to evaluate all options was not dictated by the external environment, but intrinsic, deeply held to be important by the decision-maker and, hence, unique to them and with the potential to be different between different individuals making the same decision. Furthermore, these single values were not expressed as doctrinal, organizational policies, or even legal requirements. In most military personnel (who I interviewed) "force protection" was more than an organizational or cultural norm, but was a "sacred value." Hence, my theory holds that military decision-making centers not on the presence and absence of goals (as with Power, 2016) but on the presence and absence of values.

It is a common misnomer that grounded theory involves not integrating theory that already exist, *a priori*, at that time. This is incorrect. As stated by one of the grounded theory founders (Strauss) currently existing grounded theories "they seem appropriate to the area of investigation, then these may be elaborated and modified as incoming data are meticulously played against them" (Strauss & Corbin, 1994, p. 273). Hence, the theory that emerges from my data is not a "new" theory per se, but instead is the application of an extant theory of decision-making which is yet to be applied to military decision-making, but matches the data presented here and organically arose from it (rather than being deductively applied to it). Specifically, my theory of military least-worst decision-making centers on the presence, absence and interplay of sacred and secular values.

Values are types of beliefs that guide us towards value-congruent behavior (Bardi & Schwartz, 2003; Schwartz, 2005). Values, therefore, affect the tradeoffs we are and are not willing to make in decision-making (Kruglanski & Stroebe, 2005; Rokeach, 1973). Incorporating values into decision-making can thus increase decision difficulty (especially when there is value-conflict), or can facilitate decision-making because people often hold values that are absolute; that is, they are precluded from being traded-off or traded against (Hanselmann & Tanner, 2008). Inviolable values are called "sacred values" (e.g. Tetlock et al., 2000). Sacred values are defined as "any value that a moral community implicitly or explicitly treats as possessing infinite or transcendental significance that precludes comparisons, tradeoffs, or indeed any other mingling with bounded or secular values" (Tetlock et al., 2000, p. 853). Baron and Spranca (1997) referred to such values as "protected," in that each protected value is "infinitely more important than others" (p. 2) and attempting to tradeoff against such values can elicit strong emotional reactions such as denial, blame, procrastination, and avoidance (Anderson, 2003; Fiske & Tetlock, 1997). Non-sacred values, referred to as secular, while important (often from an organizational standpoint) do not have the same inviolability.

The presence of sacred and secular values in decision-making leads to three distinct types of value tradeoff (Tetlock et al., 2000). A first form of tradeoff is *a routine tradeoff*[3] in which two secular values are pitted against each other. In the case of the hostage rescue, those secular values (something important, but not sacred) may include the desire for success with organizational policies. The second type of tradeoff is the *taboo tradeoff,* in which a secular value is traded off against a sacred value. Let us say, for example, that you hold that you must "try to save every life" as a sacred value. In this instance, this sacred value is traded-off against the more secular value (likelihood of success) resulting in a difficult, but consistent decision that you will launch a simultaneous raid because that way you didn't simply ignore your sacred value of trying to save lives. Taboo tradeoffs are "in this sense, morally corrosive" in that "the longer one contemplates indecent proposals, the more irreparably one compromises one's moral identity. To compare is to destroy" (Tetlock et al, 2000, p. 853). The mere contemplation of a taboo tradeoff is sufficient to elicit a strong negative feeling of distress (Tetlock, 2003). The final type is a *tragic tradeoff*. To

[3] It is worth mentioning that we (L. Alison and I) have a general distain for the terms "toxic," "taboo" and "routine." However, given that they are established terms within the field, and given the complexity of the analyses to come, we shall continue to use these terms to reference no sacred values; one sacred value and more than one sacred value.

demonstrate the ways in which sacred values can both make least-worst decisions both easier and harder let us reconsider our original dilemma. Looking at the hostage example above, there are several values at play that may be sacred. For example: the innocence of children; the sanctity of any life; and the need to ensure that you tried to save all possible lives could all be sacred. In which case, the least-worst decision is a tragic tradeoff because it requires individuals to trade two sacred values which ordinarily would both receive absolute priority.

So, in least-worst decisions, values (*especially* sacred values) can both facilitate and hinder effective decision-making. In my Soldier sample, where in many cases I saw a clear and single sacred value (that of force protection above all others), I often saw effective decision-making and in those cases where I did see decision inertia it was often because of a tradeoff between equal (secular or sacred) values. Below I provide an example of a sacred value at play to emphasize this point;

> *I'm sitting there getting everybody consolidated, reorganized, and distributing ammo because we didn't know if there was gonna be another attack or what was going on and we had the civil affairs major came up to me and he said 'I want you to pursue the enemy'. 'I want you to go up into the mountains and get a body count pursue the enemy.'" and I looked at him and I said 'are you kidding me?' And of course we were all standing around the top of this little hill mountain that we were on where this medical clinic was no bigger than this room right now and we were in the middle and everybody was kinda around getting stuff ready and you know…I said 'we're not gonna do that. We're gonna consolidate and reorganize, we're gonna distribute ammo and we're gonna get the hell out of here. We still have to make it out of this canyon. They let us in but it doesn't mean that they're gonna let us out. And frankly we don't have the force to pursue the enemy.' I mean at the time we didn't know how big they were, we didn't get the intel reports and stuff back until later, but it was clear that they were outnumbered and damn near overrun but for the close air support. And he said 'Captain I'm not asking you I'm giving you an order you will go into the mountains and get a body count and pursue the enemy…. Talk about paralysis by analysis, there was no paralysis here. For a split second I thought 'this is it, this is my military career'…and I said 'well Sir here's*

> *what's gonna happen; the people that are wearing this patch* [pointing at his own arm] -- *which was everybody there expect for the civil affairs team which were probably 6 guys -- I said everybody that is wearing this patch is gonna get in their vehicles and we're gonna get the fuck out of here because this is not a safe place to be. And the people wearing that patch* [pointing at the civil affairs Major's arm] *can stay here and follow you into the mountains. And at which point he got right in my face, very irate. the guy had a temper problem. He was just extremely irate you know swearing at me telling me that I was disobeying a direct order and he was gonna bring me up on charges and I just looked at him and said 'well you do what you have to do Sir and I'll do what I have to do.' And I looked over to my Platoon Leader and I said 'mount up let's get the fuck out of here' and everybody got in their vehicles including the Major who was umm the civil affairs major and we rolled out of there.*

Now, this clearly presents a least-worst decision; the officer had two choices; obey a (what he thought was risky and dangerous) order, or disobey an order and potentially end his military career. There is goal conflict, and these goals (pursue the enemy and return to base) reflect the approach and avoidance goals which Power and Alison (2017) identified as central to inertia. Yet this individual does not become inert. Instead, with relative ease, he decides and commits to a very high-risk course of action with a negative outcome. In his own words;

> *My decision-making process there took about 30 seconds. Long enough for me to think...literally I disobey this order I'm taking my 10-year career and throwing it in the garbage. But again, this was a split-second decision for me because at the end of the day I remember thinking to myself I would rather lose my commission, you know, be fired and find another job and have everybody there that was with me make it back home than you know make the wrong decision and follow an order that I knew was tactically unsound and lose my Soldiers and/or my life. So, I don't think that process took very long I guess long enough for me to kind of kinda have that conversation in my mind.*

Using my theory of value systems, I can hypothesize why this incredibly tough decision was, for this individual, so easy to make. Our Soldier demonstrates the sacred value of force protection over the more secular value of obeying orders to superior commanders and is able, in an extreme and high-consequence situation to make an effective decision. On the other hand, if he held the value of "obeying orders" or "pursuing the enemy" in the same regard as protecting his forces then it is viable to propose that he would have found this decision harder and, instead, become inert. However, and as evidenced by his actions, to this Soldier the importance of protecting the lives of his Soldiers was too sacred:

> *No, you know I…it sounds corny but I think there's a warrior ethos. There's this idea that you never leave a fallen comrade and I think that influenced heavily in my decision-making. My radio telephone operator* (RTO) *and I had a conversation when we went into country and it was right after one of our Soldiers got dragged away in a mission. He got captured and you know they ended up either decapitating him online or they did something like that, and I remember looking at my RTO and saying 'hey no matter what, don't let them take me alive' and vice versa right. I mean and we were serious like if there is nothing else put a bullet in me I just don't want to end up on CNN right so…I think that idea that you never leave a fallen comrade is really engrained at least in me and I think a lot of my fellow comrades and I think that has a lot to do with the decision-making process there was almost no doubt I was going to get those guys right? In my mind, there was almost no doubt so…for what it's worth I don't know if that's helpful to you*

While there is extensive research on both taboo tradeoffs and decision-making (e.g. Hanselmann & Tanner, 2008; Shweder et al., 1997; Tetlock, 2003; Tetlock et al., 2000), and moral decision-making as it pertains to military personnel (e.g. Eriksen, 2010; Hartle, 1989), none has gone so far as to investigate the effects of sacred values, or taboo or tragic tradeoffs in military decision-making (especially as it pertains to the emergence of decision inertia). That said, using my own data and that from other naturalistic research in this area (e.g. Power, 2016) I can demonstrate the role that sacred values can play in least-worst decision-making. Perhaps it is

easiest to present this as a simple table (and I acknowledge the over-simplicity of this representation) in which options A and B can be either sacred or secular (in line with Tetlock et al., 2003; see Table 6). To complete the table, I add my observations of the likelihood that inertia will emerge in these instances, and the ability of the decision-maker to make fast and effective decisions.

		Option B	
		Secular Value	**Sacred Value**
Option A	**Secular Value**	**Routine Tradeoff** Decision inertia due to the inability to decide between two opposing secular values (e.g. organizational policies)	**Taboo Tradeoff** Effective decision-making /absence of decision inertia due to a sacred value (e.g. Force Protection) which cannot be traded against
	Sacred Value	**Taboo Tradeoff** Effective decision-making /absence of decision inertia due to a sacred value (e.g. Force Protection) which cannot be traded against	**Toxic Tradeoff** Decision inertia/extreme difficulty in effective decisions due to tradeoff between equal sacred values which decision-maker is not willing to tradeoff against.

Table 6: Sacred and Secular Values and least-worst decision-making.

Furthermore, this view explains why certain individuals may struggle with some decisions while others will not. Consider the risk of civilian casualties in Afghanistan. General Stanley McChrystal, then Commander of the United States Armed Forces in Afghanistan, concluded in his 2009 military progress report that there was an urgent need for a significant change in the way that the International Security Assistance Force (ISAF) were operating in Afghanistan. In his words, ISAF "had shot an amazing number of people, but to my knowledge, none has ever proven to be

a threat" (McChrystal, 2009). ISAF-caused civilian casualties were eroding ISAF's credibility amongst the Afghanistan population, and in so doing significantly bolstering the Taliban's strategic goals. When Gen. McChrystal took over as Commander ISAF (COMISAF) he implemented a series of strategic and tactical innovations and adaptations focused on minimizing civilian casualties through more restrictive rules of engagement (RoE), increased alignment of civilian and military efforts, building up the Afghanistan National Security Forces (ANSF) and emphasizing non-kinetic activities. The goal was not to eliminate kinetic operations, but to ensure that kinetic activities were deployed in a counter-insurgency-centric manner (COIN) that emphasized protecting the civilian population as the ultimate target. As such, minimizing civilian casualties became a more pressing organizational policy, and the data show that this did lead to a direct reduction in the number of civilians killed by ISAF forces; see Shortland & Bohannon, 2014). However, not all Soldiers adopted this new policy. Consider, for example, when one of my interviewees had to launch a missile attack on a compound: He "knew what the collateral damage estimate was, I was just going to have to accept it." Contrast this with another one of my interviewees who, while holding that saving his fellow Soldiers is paramount, viewed avoiding civilian harm as equally important:

> *But there is the other side of me that looks at it and says, you know, that if I fired and wasn't supposed to, not only would that have probably ended my career, forget my career, I would have had to have lived the rest of my life knowing I had killed that guy. I don't know what other people's impression of the military is, if we take these decisions lightly, but I certainly didn't and I don't think other people do either. And the idea that you become jaded to the point when you stop caring about hurting innocent people. I can't imagine becoming that jaded about that decision, in fact it still bothers me to this day, the idea that I, in a fraction of a second, I could have shot that guy, and if he was you know, Taliban, great, but if he wasn't, you know, I can't imagine the thoughts that would go through my head about that guy's family, and things like that. So, it is a hard decision to live with.*

Thus, for some Soldiers the issue of civilian casualties is secular—imparted upon them top-down via doctrine and organizational policy—while for others saving civilian lives is a sacred value, a

violation of which causes moral outrage. Individual differences in sacred values can upend the decision-making calculus and crucially, explain when and why some individuals may suffer indecision and inertia while others will not. Consider this quote as a juxtaposition, in which the value of "civilian life" was clearly below that of "saving soldiers":

> *I cleared them to start engaging into this village cluster. I mean, there was nothing else I could do, I knew what the collateral damage estimate was, I was just going to have to accept it, and so, we started engaging inside the village, it was to the point where it was almost like part of the village was on fire because we were shooting rockets into the village.*

To further emphasize the presence of individual differences in sacred values: The sacred value of protecting ones' fellow Soldiers was not universal in my sample, even though it was highly important for all, some (the minority) in my sample held other values as more important. While this changed the decision that they made - because it did not change the number of sacred values at play in the decision-making process - they were still able to quickly and effectively decide between two opposing options;

> *Our duty is not to bring everyone home. As a young lieutenant, I thought that my duty is to bring everyone home safe, but that is actually not what I promised to do. So I promised to execute what, from way up there, you're advancing U.S. policy and objectives, but at my level, it is executing missions. Now, at that point, it was 'I don't think I can complete this mission with this group of folks that I have. I don't think we can get it done.' So, I don't know if it goes deep enough as to why, I am objective focused, but I think largely it is because I try my best to as much trust in my leadership to not put me into situations where we are just getting screwed.*

Conclusion

We started this chapter investigating the question of when (if at all) do members of the Armed Forces make choices. While perhaps it is counter-intuitive to explore this, the central ethos of a lot of military training (and decision-making theory) is to better equip Soldiers' to make fast, intuitive decisions with little deliberation. Hence, to eliminate choice because choosing is slow and Soldiers are not often afforded the luxury of time. I do not question the importance of such work. However, I hold that in war, certain situations will emerge that do require a choice; that is, we are required to deliberate between multiple choices. In such situations conflict can often emerge; especially when choice breeds tradeoffs. Previous naturalistic work has found that when faced with tradeoffs, decision-making often stalls and the decision-maker struggles to commit to a choice. But from what I have seen, members of the Armed Forces are better able to handle conflict and often less vulnerable to decision inertia. Here, then I engaged in a grounded theory approach to develop a theory as to how Soldiers make choices and why they are more resistant to decision inertia. I sought to explain this by looking at value systems. In tradeoffs, the degree of conflict experienced is weighted by the pre-existing values we hold, and some of these values we will not tradeoff against (sacred values). In the military, the bond between Soldiers is well known and is an important protective factor for the psychological struggle of being at war. But here I extended the importance of this, showing that, in many cases, the sacred value of force protection (or any other sacred value, such as completing the mission) often drove decision-making under conditions of conflict because Soldiers' refused to tradeoff against this; meaning that they could make fast and effective decisions. Again, as with the propositions made in Chapter 4, this proposes several hypotheses that will guide my thinking going forward. Namely;

1. Value systems predict the occurrence of inertia in least-worst situations. Specifically, when one sacred value is present decisions will be easier; but when two or more sacred values are present, decision will be harder.
2. Because Soldiers show less inertia, they have stronger value hierarchy than those who become inert (namely members of the emergency services). This means that, more often, a decision involves only one sacred value.
3. Choices will be harder to make when they involve two (or more) sacred values.

It is these hypotheses (along with those proposed in Chapter 4) that I proceed to test in the upcoming chapters.

CHAPTER 6: DEVELOPING AN EXPERIMENTAL PARADIGM

A hypothesis is a novel suggestion that no one wants to believe. It is guilty until found effective.

- Edward Teller

Over the past two chapters, and informed by data collected on real decisions made by Soldiers in the theater of war I have proposed a series of hypotheses that relate to the differences between Soldiers and non-Soldiers and the difference between making military and non-military decisions. Furthermore, in developing a theory of how least-worst decisions are made, I have proposed a series of hypotheses that relate to how such choices are made, and critically when a decision-maker will struggle to commit to a least-worst decision. Perhaps it is useful to repeat the hypotheses I have developed thus far;

From Chapter 4:

4. Individuals who enter the Armed Forces have individual differences in decision-making styles compared to those who do not join the Armed Forces. It is well known that individuals differ in their decision-making styles (e.g., a need to maximize, vs., a willingness to satisfice) and that this correlates with differing ability to avoid decisions (Parker, De Bruin & Fischhoff, 2007).
5. Training in decision-making increases resilience to inertia because of it develops a domain-general ability to make critical time-sensitive decisions.
6. The environment within which decisions are made (namely "at war") lowers the degree to which external pressures (such as accountability) are felt, preventing such factors from derailing decision-making. Research from social psychology has extensively shown that individuals are affected by the situation, and often behave in situation-relevant ways (e.g., Zimbardo, 1969). Given this, it is possible that the military environment creates social expectations for swift and decisive action.

From Chapter 5:

4. Value systems predict the occurrence of inertia in least-worst situations. Specifically, when one sacred value is present decisions will be easier; but when two or more sacred values are present, decision will be harder.
5. Soldiers will have a stronger value hierarchy, and hence, show less decision inertia.
6. Choices will be harder to make when they involve two (or more) sacred values.

In this second phase of this theses, I move from theoretical ponderings around the nature of these decisions and the way in which they are made to the quantitative testing of decisions using controlled experimental paradigms. I will explicitly seek to test the hypotheses that I have proposed over the past two chapters to provide evidence for the unique differences in Soldier samples and the importance of values as a framework for understanding least-worst decision-making. In this chapter, I explore the methodological options available to us and their strengths and weaknesses. I then outline the methodology I will be using to test these hypotheses. Furthermore, in this chapter, I offer data from a pilot study to demonstrate the effectiveness and validity of the experimental methods adopted.

Naturalistic Experimental Methods

Naturalistic researchers, where possible, seek to observe decision-makers in their natural environment. Now, while it is often problematic for them to attend and observe "live" critical incidents or operations (Crandall, Klein & Hoffman, 2006), researchers are increasingly securing access to observe (and be involved in the development of) high-fidelity training events (see Alison & Crego, 2008). Given the high-consequences and rarity of critical incidents it is often not in the best interest of practitioners for them to learn how to navigate such situations "on the go" (Kolb, 1984) hence practitioners (and naturalistic researchers) rely on live exercises to provide experience of decision-making "in the coal face". Live exercises are high-fidelity replications of complex, dynamic critical incidents such as terrorist attacks, floods, Chemical, Biological, Radiological and Nuclear (CBRN) incidents and seek to expose the decision-maker to the environments faced by individuals in real operations to generate domain-specific challenges (Jenvald & Morin, 2004). By

integrating researchers into the design of such exercises the researcher can also able to maintain experimental control and evaluate individual performance (DiFonzo, Hantula, & Bordia, 1998).

For example, a live-exercise involving a simulated terrorist attack was used in the development of the SAFE-T model outlined in Chapter 3 (van den Heuvel et al., 2012). In addition to that, a more recent SBT involving a 2-day simulated disaster with 194 participants and over 14 different agencies allowed the researchers to observe the manifestation of decision inertia in critical and major incidents which, again, is a central precursor to this thesis (Alison et al., 2015). In addition to this, the author of this thesis (and others; Waring, Alison, and Humann) recently completed a live-exercise of a critical CBRN terrorist attack occurring across 3 sites and involving almost 100 practitioners distributed across 3 sites (Waring, Alison, Shortland & Humann, *forthcoming*). Here the authors evaluated the flow of information across the 3 sites with a view to examining the dynamic interplay between situational awareness and decision inertia. Live exercises then are phenomenally powerful, both for the practitioner and the researchers who wish to study decision-making as close to "live" as possible. For the practitioners, they provide an opportunity for the decision-maker to experience the complexity of critical incidents (and indeed to make mistakes and learn) without the real-world consequences, while for the researcher they provide the opportunity to witness decision-making in an environment that is a closer reflection of the microworld within which real decisions are made. This allows the identification of the wider exogenous and endogenous pressures (e.g., accountability, trust and role confusion) that would, arguably, not manifest in more "closed" decision-making tasks (see Alison, van den Heuvel, Waring, Power, Long & O'Hara, 2013). However, such methodologies are also not without issues. Namely, that while the "openness" of SBTs allows the emergence of wider factors within the microworld, what can be lost is the ability to isolate the individual's influence and decision-making. Given this, and with a view to identifying relevant methods to test my hypotheses, I must move away from fully immersive live exercises (despite their many benefits) to develop a more controlled (yet still immersive) research methodology. Specifically, in this research I use Scenario-Based training (SBT) methods. SBTs offer a good halfway house as while providing a degree of immersion, they also allow degree of experimental control. Before I outline my SBT and its design, it is important that I outline the current methods that are used in military decision making research so we can see what a SBT-design adds above and beyond some of the more common methods.

Military Decision-Making Methods

When looking specifically at military decision-making research, there is an overwhelming reliance on mission planning exercises that are either a: table –top based pencil, or computer-assisted mission planning exercises in which a Soldier (of varying degrees of experience) is asked to navigate a mission, and work through the military decision-making process, starting with of course or action identification, then comparison and finally execution. For example, Medhurst and Berry (2009) sought to understand risk taking in military decision-making. Here the experimental method involved a simple scenario presented alongside a set of serials constructed from cards which presented a single piece of information. Soldiers were then taken through the scenario and asked to judge how they would respond to the situation. Sarah Lincoln's work on moral decision-making has also adopted similar methods; employing a series of military scenarios that vary in ethical intensity (e.g., Lincoln & Holmes, 2010). Elsewhere, others have used tactical decision-making tasks as a method to teach intuitive decision-making (rather than examine individual performance or predictors of individual differences; e.g., Vandergriff, 2006). When looking at the decision-making of small teams, Thunholm (2009) sought to examine leaders and followers' differences in decision-making styles within a land battle scenario. Here small teams (5 -7) of Army captains conducted a 6-hour planning exercise in which they had to produce a written brigade plan. Thunholm (2007), Ross et al., (2004) and Schmitt and Klein's (1994) work on the Recognition Planning Model uses similar team-based mission planning methods. Wider research investigating military decision-making (albeit loosely) have used a variety of methods from surveys to investigate the role of fatherhood on decision-making (Osman, 2003), to poker simulations (Paas, 2009), memory tasks (Aminoff et al., 2012) and business and managerial scenarios (Campbell & Campbell, 2011).

One common method for collecting data on military decision-making with military personnel is the use tactical scenarios delivered through a computer-based program. For example, Kobus, Proctor and Holste (2001) provided 52 Marines with a series of vignettes developed from a tactical decision game (Mastering Tactics, Schmitt, 1994) presented via computer screen. The screen presents a visual depiction of the situation and a series of prompts or tools available to the decision-makers (see Figure 3). Within this scenario decision-makers can click, pan, zoom in and out, review previous orders, submit orders and identify possible enemy locations. Within this

design, researchers modified the degree of uncertainty the participants were subject to (by increasing, or decreasing the amount of information provided within the scenario design). Less immersive methods that employ the same design often use paper and pencil scenarios in which the participant is given either a high or low detail mission brief and situational awareness.

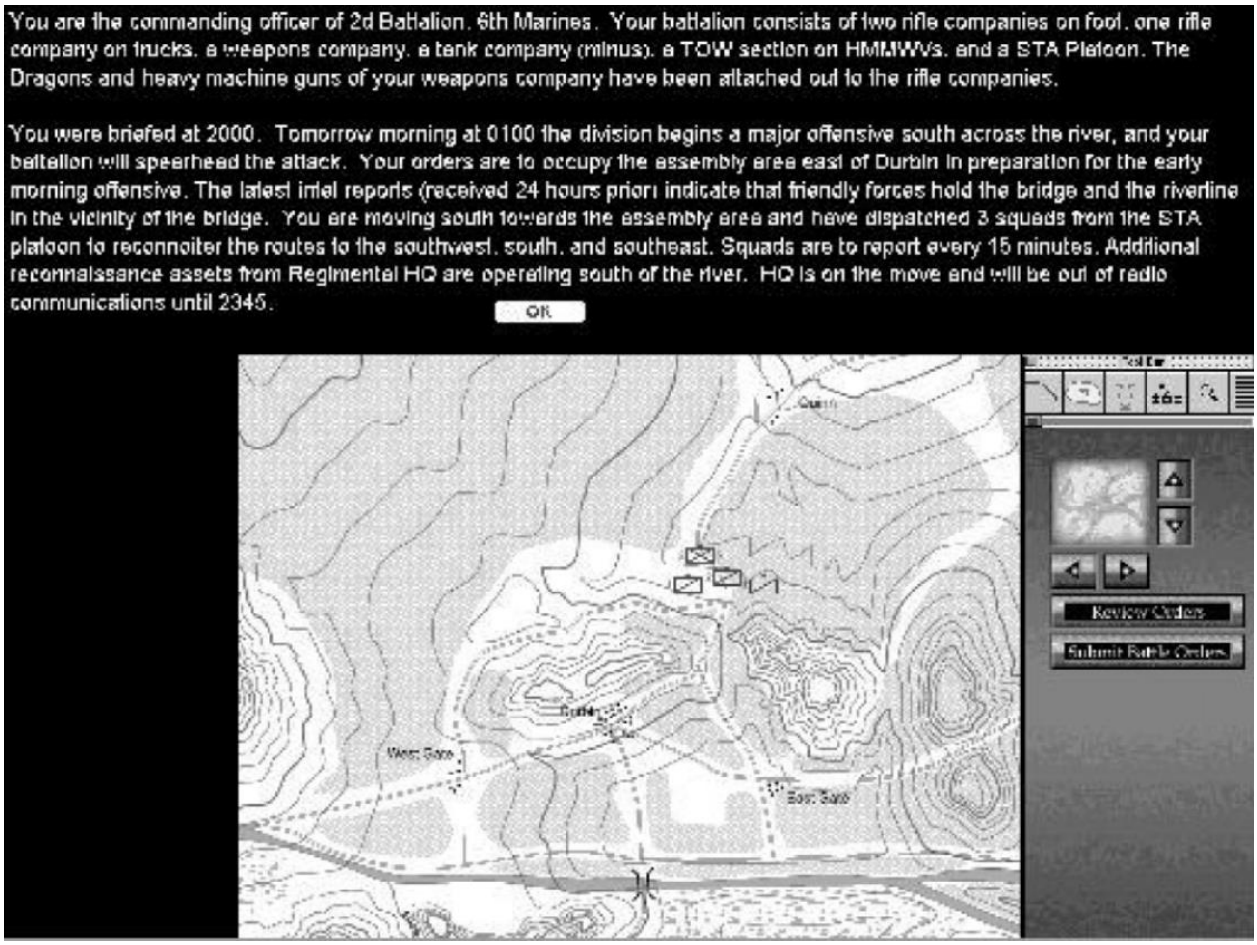

Figure 3: Dynamic display at the onset of the scenario (from Kobus, Proctor & Holste, 2001).

An alternate method, increasingly being used with the growth of technology in this area, is the examination of decision-making and performance in virtual systems. Research on video games has found that they are effective learning tools that can enhance decision-making skills (Dondlinger, 2007). Hence, virtual military training systems are increasingly being used. Deployable Virtual Training Environments (DVTE) were designed to help active-duty Marines learn and practice the elements of military Call for Fire (CFF) tasks (among other training

experiences). During such simulations, trainees act as the forward observer and are required to call in artillery fire onto targets in a simulated battlefield. The trainees have a series of tools available to them, including a compass, map, radio, and laser rangefinder. On the other hand, researchers have also used third-party generic video games to test military decision-making. For example, Vogel-Walcutt, Guidice, Fiorella and Nicholson (2013) used both DVTE and the video game "ARMA Combat Operations" (Bohemia Interactive, 2007). ARMA was used because it's gameplay scenarios closely match the style and tone of DVTE. Here, while the off-the-shelf video game did not increase learning effectiveness, those who played it prior to a learning task reported more interest in continuing to learn. Ting and Zhou's work also uses first-person virtual systems to train rapid decision-making skills for Military Operations on Urban Terrain (MOUT; see, e.g., Ting & Zhou, 2008). When looking at more immersive methods, Kaber et al. (2013) recently examined the emergence, and updating of situational awareness (SA) within a virtual-reality based squad-based unmounted military operation. Specifically, Soldiers entered one of nine Virtual Reality (VR) booths that were equipped with a rear-projection screen which displayed virtual battlefield imagery to Soldiers. Within the booth, Soldiers were required to use a mock-up of an infantry weapon that had integrated interface controls that allowed them to toggle and use a series of mission-relevant equipment (such as virtual night-vision goggles, grenades, flares and flash bangs). Soldiers were also required to don a helmet and rucksack. Each Soldier was attached to a motion tracking system that provided data on posture, position, and viewpoint. Soldiers were also linked via radios allowing them to communicate (and the researchers to monitor and record discussions). Within this VR simulation, the squads were required to complete three "missions" which involved securing a route for a small convoy through a local town. During the scenario, the squad had to complete many tasks and deal with several emerging issues (such as an armed fighting age male). Between the three missions completed, weather, time of day, and the number of casualties were varied. Overall the experimental procedure lasted two days per-squad. Despite the ability of the study to pick-up some individual differences in SA, the results were slightly dampened by the sheer quantity of SA probes required for statistical significance (see Jones & Endsley, 2000). As outlined by the authors "Future studies should focus on achieving a balance between unobtrusiveness and reliability of the real-time probe measure." (p. 343).

When looking at more-immersive SBT methods; while full-scale mission rehearsal is common within military training, it is interesting to note that most military decision-making

research does not incorporate such training. There are, of course, exceptions to this. For example, Larsen (2001) used a live field exercise to measure the ability of sleep-deprived Soldiers to inhibit the reaction to shoot when told not to. In a similar vein, Salmon et al. (2010) observed a live operational field trial of a land warfare digital mission support system to observe the efficacy (and human-technology integration) of a mission support system (although it should be therefore noted that Salmon's research was not focused on "decision-making" per se, but the overall performance of the military when a mission integrated this new system). To put this point in perspective, Helsdingen, et al. (2010) used two "field studies" to assess the effect of a critical thinking intervention on decision-making. In their own words, such studies are rare, because as noted by Helsdingen in the rationale for conducting their own work; the previous work on critical thinking and decision-making "had some limitations: they were conducted in simplified training environments." (p. 540). Yet, when examining the methods for this work, both the "simplified" and "high-fidelity" training environments were *paper and pencil*. As stated in their methods "The test scenarios were two paper-and-pencil scenarios in which the participants again played the role of battle captain and the scenario leader covered all other roles." (p. 543). Hence, even those studies that purport "high-fidelity" often rely on a paper and pencil mission task.

Methodological Considerations for this Study

Immersion and fidelity offer several benefits for both participants and researchers. Simulated environments encourage greater immersion from participants (both cognitively and socially) and increase the validity of the method (Witmer & Singer, 1998). Yet they also offer several limitations which are critical to consider for the purposes of this research (the investigation of individual values on decision-making). Firstly, as outlined by Alison et al. (2013) if SBTs serve to replicate the complexity of real-life situations, then the performance within SBTs will be as complex as it is in the real world. Furthermore, obtaining detailed individual-level data from SBTs often requires participants to enter their decisions and rationale into decision logs (Alison & Crego, 2008). So, while this method provides an "open book" for participants to reflect on the many dynamic and complex decision processes involved in their decision-making (Rosen et al., 2008a, 2008b) what it misses is the inability to tap into implicit factors that were at play during the decision-making that are, often, not available at a conscious level. What this means, is that without

prompting, value systems are therefore unlikely to be commented on in a decision log, and even if they are commented on, it is viable that the participant may not be able to reflect upon the role of this in their decision-making (made more unreliable in that I would be asking them to comment on this post hoc and in hindsight).

Contrary to the ethos of naturalistic research, the few experimental tests of the role of sacred values on decision-making have employed the type of experimentally controlled paper and pencil tasks reminiscent of the earliest work on traditional and economic models of decision-making. For example, Hanselmann and Tanner's (2008) work on the interaction of sacred values and decision difficulty involved 84 students completing a paper and pencil questionnaire that contained three decision scenarios that centered on manipulated tradeoff type (taboo vs., toxic vs., routine). In a similar vein, neuroimaging work on tradeoff type has extensively relied on written scenarios and require the participant to make a choice (see e.g., Duc, Hanselmann, Boesiger & Tanner, 2013). While such methods offer high experimental control (and high-fidelity measures of neurological activity) what they lack is the fidelity and immersion of a critical incident, meaning that I must question the degree to which I was able to translate the findings from a series of written scenarios to a real-life critical incident (it is also worth noting that none of the research uses scenarios that would qualify as "critical" or "major" incidents). Given this, in this chapter I seek to develop and test a research methodology that achieves three goals;

1. Requires participants to make relevant critical-incident and military decisions
2. Provides a degree of "immersion"
3. Allows high-fidelity measurement of individual-level metrics of performance and individual differences in value systems

Method

Experimental Paradigm

As outlined by Alison et al. (2013) "the credibility of any simulation exercise is measured according to the extent to which experienced decision-makers take them seriously and engage as they would in actual operational settings (Klein & Woods, 1993)" (p. 258). Fidelity is, therefore, the level of similarity between the simulation and the real world. Now, while here I cannot create

real-world or virtual physical fidelity (in terms of situating them within a physical environment that is similar to a real-life event) I can create cognitive fidelity by presenting them with decisions that are directly related to the environments within which they would operate. This view is much closer therefore to psychological fidelity in that it seeks to address the underlying processes relevant to decision-making (Kozlowski & DeShon, 2004). Linked to fidelity, is the sense of immersion a participant feels within a decision-making environment (Eyre, Crego & Alison, 2008). Immersion is defined, broadly, as the subjective experience of being in a situation, or an environment, when, in reality, they are in another. Kader's work outlined above is a good example of "immersion" given that, while the Soldier was in fact in a research laboratory, everything they did, saw, heard, and the environment they operated within, felt like a deployed mission in a foreign theater. Immersion is a central facet of SBT and wider NDM research because it reflects the participant's involvement and engrossment in the task at hand (Lombard & Ditton, 1997). Such engrossment is essential because highly immersive environments can create a high level of focus within participants that can transcend their awareness of the "real" external world (Murray, 1997), during which participants treat the exercise as a "real" operation (Crego, 1996). Here, while I cannot increase immersion through the visual world (i.e., creating a virtual microworld for them to operate within) what I can do is provide a virtual auditory world. While I do not question the importance of visual immersion, evidence from phobia-therapy supports the essential role of auditory immersion in creating immersion (Brooks, 1999). Furthermore, neurological research has found evidence for paired audio-visual activation, in which there is multisensory processing within the auditory cortex (see Bizley, Nodal, Bajo, Nelken & King, 2007). Sign language, for example, is "heard" in the auditory cortex (Nishimura et al., 1999). What this means, therefore, is that auditory stimuli are a central aspect of a multi-sensory experience of "immersion" and hence, auditory stimuli alone should provide a degree of immersion within a participant (and immersion above and beyond scenarios delivered without audio stimulation).

Given this, this research sought to develop a series of desk-based scenarios that could create both psychological fidelity and immersion. To do this, I relied upon the CDM interviews conducted in Chapter 4 and 5. Specifically, the transcripts from the CDM interviews were analyzed and used to create a series of "scripts" which served as the basis for a series of scenarios. Each script was also further developed with support from Subject Matter Experts (SMEs) to ensure fidelity and realism. As part of this research, SME's (where possible) included the individual who

was subject to the original decision. What this means is that each scenario was created with as much realism as possible, and as true as possible to the *original* decision that was faced by a *real* member of the U.S. Army while they were deployed in Afghanistan or Iraq. However, it is important to state that, in anticipation of the inclusion of a mon-military sample (see Chapter 8), the scenario scripts themselves were "civilianized" to a degree to ensure that the data collected could be compared between military and non-military samples who undertake this research. This "civilianization" of the military scenarios maintained the central decision point that was faced by the Soldier while presenting the content (and choices) in layman's terms. As such, the scenarios developed here maintain fidelity (in that they represent real least-worst decisions) while ensuring high quality, comparable, data will be collected from both samples. In addition to creating military scenarios using the CDM transcripts, a series of non-military scenarios were also developed using scripts used previously as part of SBT exercises hosted by L. Alison with police officers, members of the fire service, and ambulance. After the draft scenario scripts were developed they were piloted by 15 undergraduate students at the University of Massachusetts Lowell who were asked to indicate their choice (to ensure individual differences emerged), the degree of difficulty each scenario posed (to ensure cognitive conflict was being induced), and the believability, realism and the degree to which they understood what was going on in the scenario.

Once these scenario scripts were finalized they were recorded and edited to ensure a degree of auditory immersion was created. To achieve this, each scenario was "mapped" to highlight the auditory influences that would be heard if this scenario was in the real world. Audio examples of these influences were then obtained through either a: open-source examples (e.g., from Youtube), or b: recording them in the real-world. These were then integrated into the scenario using audio-editing software Audacity to create a final, single-track, immersive audio script. Overall 16 scenarios were developed for this study (seven military scenarios and nine non-military scenarios).

Scenario Design

Adopting methods commonly used in research on value-based decision-making, I sought to develop a series of A vs., B scenarios (e.g., Duc et al., 2013). The reason that I adopted a more "closed" scenario design vs., a more open interactive scenario (see e.g., van den Heuvel et al., 2012) was the need for each participant to conduct multiple scenarios. The reason for this is simple;

I cannot predict which values a participant is going to hold "sacred" (if any), given this, participants will need to be exposed to multiple scenarios that juxtapose multiple different scenarios to increase the likelihood that, at one point during the experiment, they will encounter a toxic tradeoff (i.e., a decision point which involves multiple sacred values). Here, rather than present a series of single decision point scenarios, however, I decided to employ an iterative 2-step scenario design. This was done to allow the researchers (if I so choose) to examine commitment to a course of action between two steps (a viable metric of their commitment to a choice of action; and hence decision inertia).

Now, while we cannot fully control the phenomenological experience of the individual as they experience each scenario, a series of boundaries were developed to ensure consistency in the design of each scenario. Specifically, these were:

- An A or B decision (i.e., a binary choice)
- Involving a collapsing window of opportunity without being precise about a time limited deadline. In all cases, for every second that you delay, there is a risk of the situation getting worse.
- Ability for the situation to be understood by both military and non-military personnel.
- All roughly same amount of time (audio) and offering the same amount of detail regarding the situation (Situational Awareness was not a variable being manipulate, hence it was controlled throughout the scenarios).

For the two-step A vs., B scenarios individuals were presented with an audio-feed that provides them an assessment of the situation and a required action. The participant was then asked to choose how likely (on a Likert-scale of -5 "very likely to choose option A" to 5 "very likely to choose option B") they are to choose option A or option B. A 11 point likert scale was adopted as to allow the participant to highlight their strength of preference for a choice A or B. This, I felt, allowed for a measure of commitment. Based on the work of Power (2016) in each scenario one option will represent an approach goal (i.e., a way to make a positive impact on the situation), while the second option will represent an avoidance goal (e.g., avoiding further harm). Power's work with the Police identifies that juxtaposing approach and avoidance goals often create cognitive conflict and inertia.

Once the individual has made their decision they will be presented with a further input (the "second step") and then asked to re-evaluate the likelihood that they will choose Option A or Option B.

To put this method in perspective, an example scenario script is presented below. This scenario would be delivered via an audio feed, with corresponding audio cues and background noise:

> *"Hi Captain. I have just had some guys from the Special Forces come into the tent. They say they have received some intelligence about the location of some insurgents. The source of the intelligence is the brother of one of the local insurgents and these insurgents are the same ones that have been attacking our base and patrols over the past month or so. He says they have a base of operations up in the Mountains to the north of here. We are streaming some video footage of the area as we speak. I'll send it over now. The footage is pretty grainy, but there is definitely some movement up there. The Special Forces guys think that the insurgents will be gone by morning and want to know if you want to start the process of launching an airstrike?*

After being exposed to this audio input the participant will be asked to choose their course of action (-5: I will definitely not deploy air support; 0: I am unsure; 5: I will definitely deploy air support) and their confidence level. After the participant has indicated their decision a second inject will test their commitment to this course of action. In the example above, if the participant did choose to deploy air support (choices 1 – 5) the following inject would be delivered:

> *"[Call from the commanding officer]. Captain, I have just heard that you are trying to launch an airstrike? What the hell are you doing? We are in the command center looking at the exact same intelligence as you! Did you not think that they could be civilians, they're probably up there cutting wood or something!"*

Again, after being exposed to this audio input the participant will be asked to choose their course of action (-5: I will call off the air assault; 0: I am unsure; 5: I will continue to the air assault) and their confidence level.

It is important to state that after the participant was exposed to the audio feed they were asked to "click onto the next page when you are ready to make a decision." The reason that the decision and the scenario track were hosted on different pages was to ensure that the varying lengths of audio input did not affect measures of decision-making and choice selection (see below). Furthermore, the use of a two-step, rather than a one-step scenario is to test an individuals' commitment to the choice that was made during the first step. This adds an important variable given that a core characteristic of decision inertia is the inability to *commit* to a choice and undertake the behaviors required to execute the action. While decisions cannot be behaviorally executed within this paradigm, a two-step scenario offers insight into the participants' degrees of commitment to a choice. However, it is also important to highlight that this two-step method also leaves the participant at risk of consistency bias, in which they continue to commit to a choice solely because they previously made it (rather than because they are truly "committed" to it). While this is an important consideration, given that all choices made in this research paradigm are anonymous (i.e., they are not verbalized to a "team," or the researchers), I believe that I am mitigating this effect. Consistency to a prior choice is often driven by the social commitment to a choice (i.e., telling others what you are going to do), and it is this social commitment that is the barrier to change. Choice anonymity removes and therefore mitigates this issue.

Psychometric Pre-Measures

Based on the hypotheses proposed so far and an analysis of previous literature several psychometric pre-measures were incorporated into the study methodology. Specifically, I sought to measure Need for Closure (NFC); the self-reported need for maximization and experience and an individuals' value construct. I elaborate on each of these below:

Need for closure (NFC). NFC is the desire to obtain a definite answer to a topic or question, rather than experience confusion and ambiguity (Kruglanski, 1989, p.14). Hence, NFC is the desire for an answer, any answer, rather than confusion and ambiguity (Kruglanski, 1990). In this study, NFC will be measured via the 'Need for Cognitive Closure Scale' (Kruglanski, Webster & Klem, 1993). Hence, those who score highly on NFC limit their cognitive processing to minimize uncertainty and achieve rapid closure in a decision-making task. The five traits that characterize those who score high on NFC are; (i) a desire for order and structure; (ii) discomfort

through ambiguity; (iii) decisiveness; (iv) predictability; and (v) close-mindedness (Webster & Kruglanski, 1994).

Maximization. Maximization is the need to maximize a situation and is often linked to poor outcomes. As outlined in Chapter 2 and 3, effective decision-making in time-sensitive situations is reliant on the ability to "satisfice" and choose an alternative that is "good enough" (Simon, 1978). Maximizing is, therefore, trying to select the option with the highest expected utility. Building on Simon's work, Schwartz et al. (2002) sought to develop a scale that measured the degree to which individuals are hesitant to "satisfice" and instead seek to maximize the outcomes of any given situation. Because of the many challenges with maximizing outcomes, those who do so experience less happiness, optimism, and life satisfaction, while incurring more depression, perfectionism, and regret (Schwartz et al., 2002). While no study has specifically examined the role of maximization in the military or critical incident responders, it is viable to assume it holds an important role. Furthermore, given the focus on decision inertia in this thesis, maximization seems especially pertinent given than self-reported maximizers report greater levels of decision avoidance (Parker, De Bruin & Fischoff, 2007). Here I use Schwartz et al.'s (2002) 34-item measure of tending to maximize, rather than satisfice, which uses a scale anchored at 1 (completely disagree) and 5 (completely agree). This scale includes items such as "When I watch TV, I channel surf, often scanning through the options even while attempting to watch one program." Schwartz et al.,'s (2002) maximization inventory includes three separate types of maximization behavior; namely satisficing, decision difficulty and alternative search (see Turner, Rim, Betz & Nygren, 2012 for a full outline of the measure).

Experience. The final factor measured here is experience. Naturalistic decision-making, specifically RPD puts a premium on the role of an individual's experience when making decisions during uncertain situations (see Lipshitz et al., 2001; Klein, 1997). Experience aids situation assessment, option evaluation, and mental simulation of the potential option outcomes (Lipshitz et al., 2001). In this study experience (alongside other demographic variables such as quantity and quality of training as well as a measure of interpersonal trust) will be measured via a pre-scenario questionnaire.

Post-Measures

As part of this study, two important post-measures were taken; both of which were adapted from Hanselmann and Tanner (2008). Hanselmann and Tanner (2008) sought to investigate the effect of tradeoff type on decision difficulty. To do this they required a measure of both values systems and decision difficulty. Hanselmann and Tanner (amongst others) defined decision difficulty as "the level of perceived difficulty or ease of selecting among choice options." (p. 52; for a review, see Anderson, 2003). To measure decision difficulty they used a single, and multi-factor measure. The single-item measure involved the participant answering the question "How easy or difficult was it for you to decide? For me, this decision was... (7-point scale ranging from 1 [very easy] to 7 [very difficult])." (p. 63). The multi-item measure, on the other hand, involved five statements with a 7-point scale (ranging from 1 [strongly disagree] to 7 [strongly agree]). The five statements used in this scale are;

1. For me, this decision is... (7-point scale ranging from 1 [very easy] to 7 [very difficult])
2. I would need more time to decide.
3. I would not ponder for a long time on this decision.
4. I feel very ambivalent about this decision.
5. For this decision, I feel certain which option to choose.

After piloting the decision difficulty scale, several changes were made to increase its suitability for this study. Firstly, the items were personalized meaning so "I would not ponder this decision…" becomes "I did not ponder this decision…". Finally, an additional item was added to the scale. This item, "I wanted more information before I made my decision" was inserted to measure individuals' tendencies to delay a choice. Here I also used a sliding scale of 0 to 100 to increase the fidelity of the measure above a 7 point likert scale. A decision difficulty questionnaire was provided after each scenario (16 in total).

In addition to this, Hanselmann and Tanner (2008) used the sacred values measure (SVM) proposed by Tanner, Rfy and Hanselmann (2007). While they provided an updated version of the SVM in their experiment, given the sheer length of the study (and the very real risk of participant fatigue) I opted for the original 4-item SVM (see Tanner et al., 2007). Furthermore, the 4-question

version of the SVM is shown to have good internal consistency (higher than .79) and construct validity (Tanner et al., 2007). This version of the SVM asks participants to rate their agreement with four statements relating to a given value. For example, with the value "saving lives" the SVM would ask participants to "Please rate your level of agreement with the following statements about saving lives" and present the following four items;

1. My stance on this issue might change over time.
2. I would not change my opinion, no matter what the costs.
3. I would have problems making any concessions on this topic
4. There are principles involved in this topic that we should defend under any circumstances.

In this study, each of the scenarios was examined to identify which values related to the options on offer. Overall, 11 values were identified (see Table 7), hence, after the participant has completed all the pre-test measures, and scenarios, they were asked to complete an 11 SVM relating to the 11 values involved in this study.

Value
Avoid blame for my actions
Act within the law
Everyone's right to free will
Protecting the Life of people under my command
Protecting the life of a civilian
Protecting the life of a fellow Soldier
Ned to exert my authority over others
Completing the mission
Pursue a known enemy
Avoid negative consequences for your action
Obey the orders of a superior

Table 7: Values measured during the 16 scenarios.

Measures of Decision-Making

The study itself was hosted on the online survey tool Qualtrics to allow the measurement of high-fidelity reaction times within the scenario, as well as overall. Hence, for each scenario (in addition to their choice preference, the strength of preference, and decision difficulty) the following reaction time measures were collected:

1. Amount of time spent listening to the audio input
2. Amount of time between the end of the audio input and choosing to progress to the decision-making phase of the scenario
3. The amount of time taken to mark the first preference
4. The number of times the participant changed their preference
5. The overall time taken to commit to a choice of action
6. The time between selecting their final choice of action and "committing" (i.e., submitting) to a decision

Overall then the designed study exposes participants to a series of forced-choice scenarios which require them to navigate both military and non-military scenarios. A series of psychometric and demographic pre-tests are collected as is a measure of their value systems. In terms of dependent variables, a host of choice, and reaction times are collected as are subjective evaluations of decision difficulty. To help the reader visualize the "flow' of the study, Figure 4 shows the outline of the study from informed consent to debrief. Furthermore, for the full experimental script, including the scenario scripts, please see Appendix G.

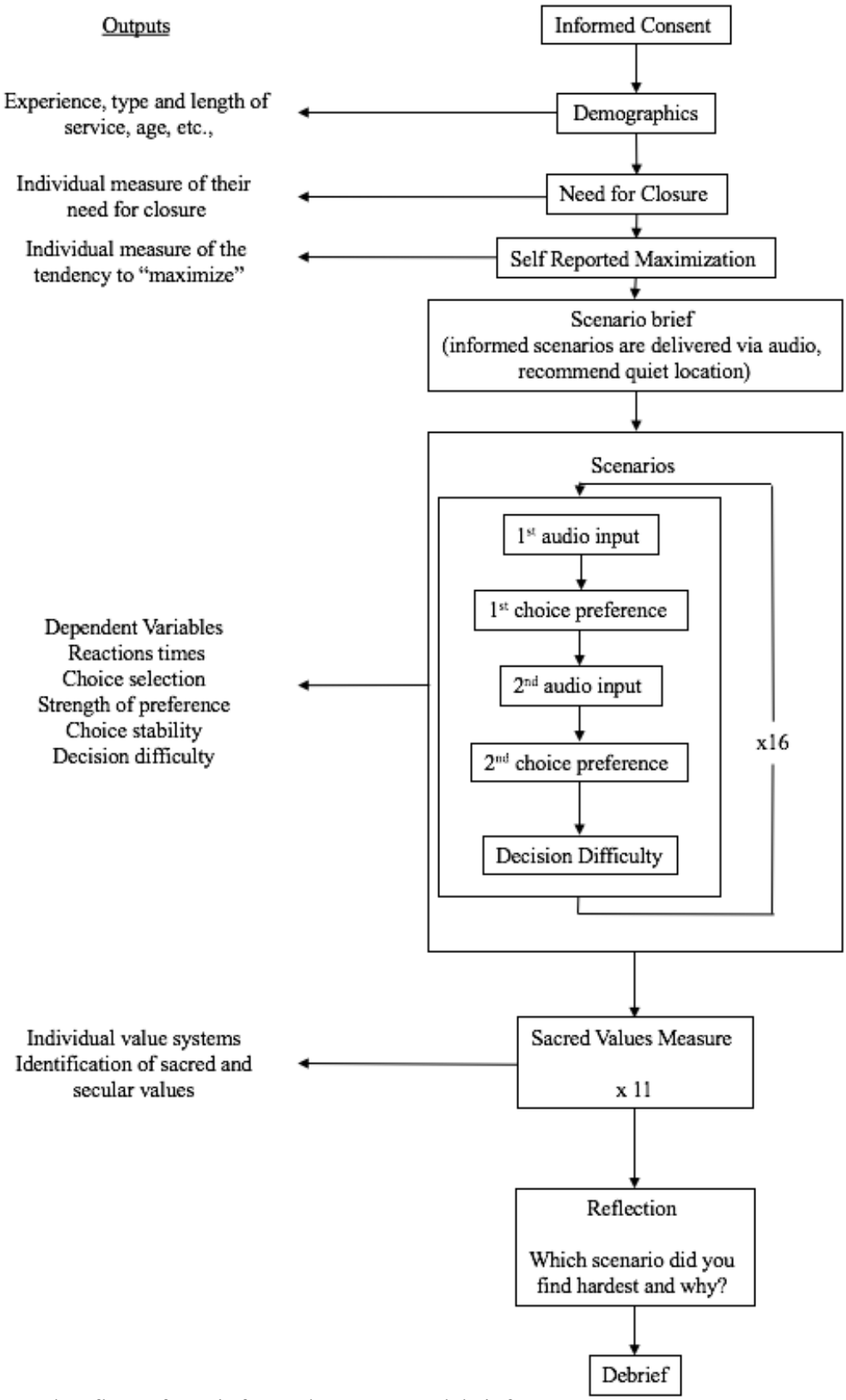

Figure 4: Study "flow" from informed consent to debrief.

Pilot Study

Purpose

To test the hypotheses proposed at the start of this chapter the proposed experimental method must satisfy several criteria. Specifically, individual differences in values, decision-making, decision difficulty and response time must emerge. Hence, before using this research methodology with Soldiers and members of the emergency services it is important that I conduct a pilot study that allows us to investigate if individual differences in performance are detectable within this experimental paradigm. Below I outline the methods, results, and implications of this pilot test.

Participants

Eleven individuals took part in the pilot test of this study. While 18 individuals started the study, only these 11 completed it. Furthermore, of these 11, one individual did not complete the sacred values measure (one more participants' SVM scores were excluded after the scores indicated a lack of validity; i.e., all questions, for all values were marked the same score). While these two participants could not be included in the analysis of values, their results were kept because they completed both the NFC and maximization scales and the 32 decision points. Of the eleven individuals who took park in this study, five had been, or were currently, a member of the Armed Forces. Of these five, four (80%) had been deployed to a theater of conflict. Four were Army, and one was Navy. The average service length of these five Soldiers was 16.2 years. Of the 5 Soldiers, one individual has also served as a member of the emergency services (police). None of the non-Soldiers had served in the emergency services. Before I outline the results of this study, it is important to state that while only 11 participants took part in a pilot test of this study, each participant completes 32 decision points, 16 decision difficulty questionnaires, and provided 11 sacred value measures. When viewed in this light, this pilot test involves more decision points (352) than many of other full studies that have sought to investigate sacred values and decision-making (e.g., Hanselmann & Tanner, 2008; 84 participants and 3 scenarios = 252 decision points).

Procedure

Participants were opportunistically sampled through a series of recruitment calls that were distributed through the student, and veteran population at the University of Massachusetts Lowell. Participants were instructed via the call for recruits (see Appendix H) to click on the hyperlink provided in the call for participants. This took the participant to the Qualtrics-hosted study from which they read and agreed to the informed consent. From here, participants completed the two pre-test measures, 16 scenarios, 16 decision difficulty questionnaires and the 11 sacred value measures. All scenarios were randomly presented to all participants, however, the order they were presented in was randomized. All choice and reaction time data was collected automatically via Qualtrics and was available to download by the researcher as an excel spreadsheet.

Results

Overall Decision-Making

For the following analyses, I focus solely on the amount of time participants took in the decision-making phase of each study (i.e., after they had listened to the audio feed and clicked that they were "ready to make a decision."). Furthermore, I adopt a within-subject design meaning that each decision point is examined independently (n = 352) rather than decision-making overall (n = 11). When analyzing the results, and sensitive that the study was conducted outside of the laboratory and in the participants' real world (in which more distractions exist), I examined reaction times for any outliers that may be indicative of distraction. In line with Ge et al., (2009) when looking at the overall reaction times, any reaction time two standard deviations above the overall mean for the group were excluded (in this study the threshold was 49.22 seconds). This resulted in a final sample of 345 decision points. On average, across the scenario, participants took 8.16 seconds to decide (SD = 6.65 seconds). When looking at the strength of choice preference, participants on average selected an option with medium-high levels of confidence (3.97, SD = 1.52, where 5 = complete certainty and 0 = unsure). Looking at decision difficulty (α = .682), on

average across the entire experiment, participants found the scenarios somewhat difficulty (mean difficulty overall = 49.16, SD = 37.47).

A series of Pearson's correlations were run to investigate the relationship between reaction time, strength of preference and decision difficulty. Overall, strength of preference was not significantly correlated with reaction time ($r(11) = .169$, $p = .620$). To run correlations with decision difficulty, decision difficulty scores across the 5 items within the decision difficulty questionnaire (once correctly reverse coded) were averaged (summing was not used due to the presence of missing data in some decision difficulty questionnaires). Reaction times for both decisions within each scenario and the strength of choice preference for both decisions within each scenario were then summed to provide 16 items per participant rather than 32. Here, a Pearson's correlation found that there was not a significant correlation between decision difficulty and reaction time ($r(11) = -.378$, $p = .252$) or decision difficulty and strength of preference ($r(11) = .433$, $p = .184$).

Need for closure. Participants' NFC was measured using 15-item shortened NFC scale developed by Roets and Van Hiel (2011; tested here as $\alpha = .962$ which is much higher than the established α of 0.84; see Kruglanski et al., 1997; Webster and Kruglanski, 1994). The shortened scale achieves similar psychometric scores and correlations as the full scale and is suitable for use here given the concerns surrounding participant fatigue and the length of the survey. Overall, Pearson's correlation found that NFC was not correlated with decision-making speed ($r(11) = .336$, $p = .313$), nor was it correlated with strength of preference ($r(11) = -.399$, $p = .224$) or decision difficulty ($r(11) = -.305$, $p = .362$).

Self-Reported Maximization. Participants' self-reported maximization was recorded using the Schwartz et al. (2002) maximization inventory ($\alpha = .747$). Overall, and unsurprisingly, a Pearson's correlation showed that participants' NFC and maximization scores did not correlate ($r(11) = -.221$, $p = .513$). Here I examine the role of self-reported maximization in general as well as the analysis of the specific constructs contained within the scale (satisficing, $\alpha = .884$; decision difficulty, $\alpha = .780$; and alternative search, $\alpha = .937$). Pearson's correlation found that those who, overall, score high on the maximization scale did not show a stronger strength of preference ($r(11) = .399$, $p = .224$). Overall

maximization did not significantly correlated with self-reported decision difficulty ($r(11) = -.149$, $p = .662$).

Sacred Values. The SVM identifies, for each participant, the importance of the identified values. Here the Cronbach's alpha for the SVM was lower than previously reported for this scale ($\alpha = .384$) and would have been significantly higher if the first item ("I might change my view on this over time") was removed ($\alpha = .807$). To analyze the importance of each value, the next sum of score across each of the four items on the SVM were summed (after item 1 "I might change my view on this over time" was reverse coded). This, for each value, gave participants a score of between four and 28. Ten of the 11 participants completed the SVM. One more participant was excluded for giving each value the same score, across the same variables. The overall importance of the values, in rank order of most important to least important, are shown in Table 8.

Value	SVM Score *(4 – 28)*
Avoid blame for my actions	19.40
Protecting the life of a civilian	17.33
Protecting the life of a fellow Soldier	16.36
Protecting the Life of people under my command	14.91
act within the law	14.64
The right to free will	14.50
Pursue a known enemy	14.09
Completing the mission	14.00
Need to exert my authority over others	13.80
Obey the orders of a superior	13.00
Avoid negative consequences for your action	12.30

Table 8: Value importance, as rated by the SVM.

Previous research that has examined tradeoff type and decision-making has been restricted to a few, simple, scenarios. Hanselmann and Tanner (2008) for example, used two scenarios with only two values being measured. Here I have 16 scenarios with 32 decision

points and 11 different values (multiple of which are often involved in a single decision point). The analysis here is therefore exponentially more complex, nor has it been done before, providing little in terms of theoretical guidance with which I can follow. Given this, a series of basic activities were conducted with a view to achieving the following two essential tasks;

Task 1: Identifying "sacred" values. Individuals differed, not only in the importance given to each variable but also with the baseline value score for all items and degrees of deviations with which they associated importance. For example, while the mean importance of each variable was 14.89 overall, the average within an individual ranged from 20.27 to 8.4. What this means then is that denoting a value as "sacred" must be done within individuals, rather than between, and hence a value being "sacred" must denote a significant deviation in the average importance of all values, *to that individual*. This will prevent the use of overall "thresholds" which would mean that, while for some no values are "sacred," for others, almost all values would be "sacred." Hence, here, to denote a value as sacred to that individual there score on that variable must be at least one standard deviation above the mean score for the other 10 SVM scores. The one standard deviation barrier was adopted because it is commonly used within the field to denote a significant deviation from the norm and hence, as a classification score (e.g., Clemmons, Walsh, DiLillo & Messman-Moore, 2007).

Task 2: Establishing tradeoff types. The more complicated process is then identifying which values are involved in each of the 32 decision points to identify, for each person, whether that specific decision involved zero, one or two sacred values (and hence was it routine, taboo or toxic). To achieve this, the author of this thesis went through each scenario and identified which of the 11 values were directly being traded-off within each scenario. The same task was also then conducted by an individual with no experience of the scenarios and their contents. They were provided an empty matrix box (identical to that shown in Table 9) and provided the audio files for each scenario. They were then asked to identify which values were involved in each decision point. The primary author then compared the two value matrices. When the two reviewers disagreed, a third reviewer (also

blind to the original scenario design) adjudicated. The final value matrix is shown in Table 9. Overall, the measure of inter-rater reliability (Jaccard's coefficient) for this task was very low (.28). With these two tasks complete I could examine the effect of tradeoff type and decision-making.

	Scenario																															
	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Protecting the life of people under my command	■	■	■	■									■	■	■	■									■	■	■	■				
Protecting the life of a fellow Soldier	■	■	■	■									■	■											■	■	■	■			■	■
Protecting the life of a civilian															■	■					■	■										
Completing the mission	■	■									■		■																			
Pursue a known enemy	■	■									■										■	■				■	■	■			■	■
Avoid negative consequences for your action					■	■	■	■				■		■					■	■								■				
avoid blame for my actions												■		■																		
act within the law							■	■	■	■							■	■					■	■								
Everyone's right to free will	■						■		■	■							■	■	■	■			■	■					■	■		
Ned to exert my authority over others																	■	■	■	■									■	■		
Obey the orders of a superior												■		■												■						

Table 9: Value matrix showing the individual values at play during the 32 decision points navigated as part of this study.

Looking at participants' value systems, on average, each participant had 2 sacred values (Mode and Median = two, Mean = 1.77 sacred values). Furthermore, the specific values which were sacred to the participants were highly varied. No one value, as measured by the SVM, was "sacred" to more than 2 participants (18.18%). In addition, only two values were not identified as being sacred to at least one participant ("avoid negative consequences for your actions" and "pursue a known enemy").

With individuals' sacred and secular values now identified, and the value matrix constructed (Table 9) I re-coded decision points as to whether they reflected a taboo, routine or toxic tradeoff. For the nine participants left, the 288 decision points manifested in 192 routine tradeoffs (no sacred values), 72 taboo tradeoffs (one sacred value) and 24 toxic tradeoffs (more than one sacred value). A one-way repeat measures MANOVA was run with the three tradeoff types (Routine x Taboo x Toxic) as independent variables and markers of decision-making as independent variables (decision-making times during the situational awareness phase; decision-making times the decision-making phase; and decision difficulty). Overall there was a statistically significant effect of tradeoff type on performance within the scenario ($F(8, 552) = 3.202$, $p < .001$; Wilk's $\Lambda = 0.913$, partial $\eta^2 = .044$. Given this a series of univariate ANOVAs were run. These found that tradeoff type significantly affected timing during the situational awareness phase of the scenario ($F(2, 279) = 5.797$, $p < .005$; Wilk's $\Lambda = 0.450$, partial $\eta^2 = .33$), the amount of time it took them to commit to a choice ($F(2, 279) = 3.634$, $p < .05$; partial $\eta^2 = .025$); and self-reported decision difficulty ($F(2, 279) = 3.221$, $p < .05$; partial $\eta^2 = .023$). Post hoc analyses (using an adjusted Bonferroni test to accommodate the large number of comparisons) found that, when looking at the situational awareness phase of a scenario, participants were significantly slower for routine tradeoffs ($M = 33.72$ seconds, $SE = 1.26$) than taboo tradeoffs ($M = 26.308$, $SE = 2.08$, $p < .05$). When looking at decision-making speeds, participants were significantly slower to commit to a choice when it involved a toxic tradeoff ($M = 7.59$, $SE = 1.85$) when compared to a routine tradeoff ($M = 2.31$, $SE = 0.66$, $p < .05$). In terms of self-reported decision difficulty, participants reported that taboo tradeoffs were harder ($M = 54.98$, $SE = 2.54$) than routine tradeoffs ($M = 47.52$, $SE = 1.55$, $p < .05$). The mean plots of tradeoff type and situational awareness speed, decision-making speed, and choice commitment speed are shown in Figure 5.

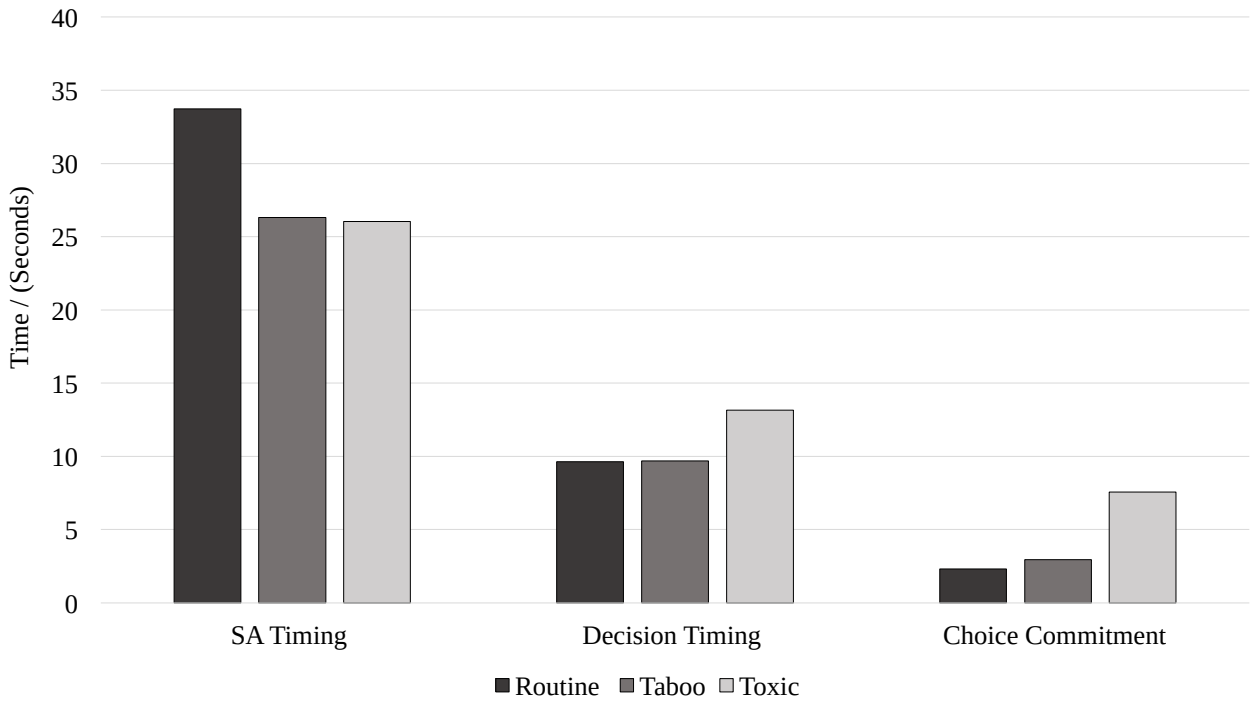

Figure 5: Tradeoff type and situational awareness timing, overall decision timing, and choice commitment timing.

Discussion

It is important to state that the goal of this chapter was not to measure decision-making nor my theory *per se.* Instead, this chapter sought to outline the development and piloting of an immersive desk based decision-making task that achieved three goals;

1. Requires participants to make relevant critical-incident and military decisions
2. Provides a degree of "immersion"
3. Allows high-fidelity measurement of individual-level metrics of performance and individual differences in value systems

With these goals in mind, it is arguable that this study then was a success. While the first two points are, to a degree, subjective, participant feedback provided informally shows

evidence of immersion and many participants shared extremely positive feedback for the study and their experience. Moving on to the third objective the results here also show high degrees of both individual difference and the influence of value systems. This, coupled with the identification of several statistically significant predictors of performance within this scenario further support the validity of this method. Below I outline some of the important metrics surrounding this study, as well as outline some of the (expected and unexpected) preliminary results which are emerged from it.

First and foremost, overall, participants' reaction times implied that they were engaging in a deliberate choice. Specifically, the average decision-making time was close to 8 seconds with 6 seconds of standard deviations. This, coupled with the relatively high average decision difficulty score, implies that on average, participants found the scenarios to be challenging and did engage in an active decision-making process. The fact that decision-making speeds were significantly affected by tradeoff type further implies that participants were engaged in a cognitively active choice process and not selecting arbitrary choices. The fact that the average "strength" of preference was also midway (with a standard deviation or +/- 2) also implies that participants were not making arbitrary choices. Here again, the positive correlation between self-reported decision difficulty and both strength of preference (being less sure of hard decisions) and reaction time (making slower decisions when choices were harder) all support that participants were engaged in the study, making active choices, that they found some scenarios harder than others, and that their behavior within the scenarios reflected how hard (or easy) they found a given scenario.

Overall, while the *very* small sample size precludes us from drawing concrete conclusions here and relating my findings to the wider literature on these constructs (something I will do in the next chapter) what I can say is that my NFC and maximization scales show strong validity (very high Cronbach's alpha scores for both NFC and maximization and each sub-component of the maximization scale) and both scales show correlations with performance on the decision-making task in both predicted and unpredicted directions. This strongly supports the internal validity of the study developed here in that performance within scenarios and their subjective perception of decision

difficulty appear to be directly related to individual differences in their NFC and self-reported maximization.

In line with this, there is also evidence here that the SVM is a useful tool for understanding participants' value systems and furthermore, that these value systems can be used to predict performance in the decision-making task. First and foremost, while the Cronbach's alpha for the SVM was much lower than in previous efforts to use it (e.g., Hanselmann & Tanner, 2008; Tanner et al., 2007), it is possible that this can be raised to a much higher level if certain items are removed (namely item 1). This finding specifically warrants further consideration if replication with a much larger sample maintains this finding because it gives pause that the measure is so central to the importance of a value (i.e., changing one's mind). Here, because the goal of this chapter was to develop and trial the methodology (rather than make concrete assertions surrounding value systems and decision-making) the choice was made to use the SVM as is. However, any further use of the SVM will use a Cronbach's alpha analysis to identify if any items should be removed from the analysis prior to calculating sacred values.

A central part of the study is the ability to identify values that are "sacred" and the ability to calculate (in hindsight and without reference to the participant's self-explicit awareness) which scenarios involved routine, taboo or toxic tradeoffs. Here then, using the SVM to analyze participant's value systems across 11 critical values I identified as playing a role in the 16 2-step scenarios they navigated, I identified which values were sacred. Because the previous uses of the SVM are not as complex as my study (in terms of the number of values and decision points per participant) I was required to construct a new method of identifying how "sacred" a value was. Here then, employing a threshold that has commonly been used in social science (e.g., Verdugo & Verdugo, 1989; Witt, Burke, Barrick & Mount, 2002), I defined a value as sacred if the participants' score on the SVM for that specific value was one standard deviation above the mean SVM for all 11 values. The reason that I employed a within, rather than between subject threshold was a clear individual difference in the baseline SVM score per participant (from 20.27 to 8.84). Furthermore, when I employed a within-subject threshold for sacred values a consistent number of sacred values emerged per participant. Sacred values, in accordance with Tetlock (2003), are absolute, and non-exchangeable. Hence it is important that they are

rare because if we hold many sacred values then we would be rarely able to make effective decisions as all options would violate a sacred value. Here, on the other hand, I identified, on average, 2 sacred values per participant. Furthermore, which values were identified as "sacred" were often highly diverse, and ranged between participants. In fact, no value was viewed as sacred by more than two participants. With this in minds then the SVM (and specifically my classification criteria for sacred and secular values) shows clear face validity in that it the sacred values it identified were rare and highly individual. This makes intuitive sense when I consider that my sacred values (when viewed as a guiding mechanism for decision-making) are incredibly personal and capable of predicting individual differences in decision-making in the face of least–worst decisions.

On this last point, my pilot study also showed evidence that value systems, as measured by the SVM were directly related to the decision-making of participants within this study. By identifying participants value systems, and the values at play within each of the 32 decision points I was able, for each participant, to identify the type of tradeoff that each scenario represented to them. Now the importance of this cannot be underestimated because what this means is that the same scenario can reflect three different types of tradeoff for three different participants.

Let us consider, briefly, the tunnel scenario. Here the audio inject informs the participant that there was an explosion in a bridge and they have police officers in a tunnel evacuating casualties, however, there is intelligence of a potential second device. They are asked if they are going to evacuate the tunnel (saving their officers but leaving the civilians), or leave them there (potentially saving the civilians but risking the lives of their officers). Now, this scenario has two central values juxtaposed; saving the lives of civilians, and saving the lives of people under your command. If, to the individual neither value is sacred, this is a simple routine tradeoff (deciding between two values that are not sacred). If an individual holds the value of "protect the life of people under my command" then this scenario is taboo – meaning that it should, in theory, be relatively easy as they will not tradeoff against this sacred value. However, if the individual holds both "saving the lives of civilians" and "saving the life of people under my command" then this scenario is toxic because both are at play in this scenario.

Here then, independent of what the actual scenario itself was, I compared participants' decision-making when they were faced scenarios which to them, were routine, taboo or toxic. Here, and despite the issues with sample size (i.e., that toxic tradeoffs were far rarer than routine and taboo tradeoffs), I found that participants *did* struggle to commit to courses of action when faced with a toxic tradeoff. Specifically, the time participants took between selecting a course of action and "committing" to it (i.e., clicking submit). The data here showed that when they were deciding within a toxic tradeoff this commitment time was significantly higher (see Figure 5). They also, on average, took longer to decide but this was not significant (however I shall revisit this, and all, analyses in the next chapters when the sample is much larger). What is also even more interesting, is that decision difficulty was not higher for toxic tradeoffs when compared with routine and taboo (in fact it was highest for taboo). What this perhaps implies (and again, this shall be revisited in the next chapter with a larger sample size and more statistical power) is that perhaps there is a psychological defense mechanism at play with toxic tradeoffs in which while the choice is harder to make, once the choice is made, post hoc bolstering occurs (see Janis & Mann, 1972) to prevent post-decision guilt in response to the need to have sacrificed against a sacred value. Such an explanation, if confirmed in the ensuing analyses, would be in line with Tetlock's (2003) original view of sacred values, within which to "even to think about certain tradeoffs (less still to make them) is to corrupt and degrade one's standing as a moral being in the community." (Tetlock, 2000, p. 241). Hence, the dissociation between reaction times and self-reported decision difficulty demonstrates the potential ability of this research methodology to identify important discrepancies between implicit and explicit experiences of decision-making.

Conclusion

In this chapter, I outlined the methodological paradigm I will be using to test the hypotheses that have emerged from my qualitative data collection and analysis. I outlined the rationale behind the design and the efforts I have taken to balance experimental control with immersion. I outlined the process through which I developed 16 immersive 2–step scenarios and the measures that will be used to measure decision-making styles (NFC,

maximization) and value systems. Furthermore, I outlined the results of a pilot test of this methodology on 11 individuals which rendered 352 decision points for analysis. In addition to this, I outlined, trialed, and then tested a methodology to identify value systems and which values are sacred, and secular to them, and henceforth, which scenarios reflect routine, taboo and toxic tradeoffs. Here, both individual measures of decision-making style and tradeoff type was shown to affect decision-making performance and difficulty. Even though several findings support my hypotheses (e.g., that individuals struggle to make least-worst decisions when dealing with a toxic tradeoff) I was cautious not to draw any theoretical conclusions from this chapter given the small number of participants. However, what these significant findings do show is the validity of my method to create, and measure, individual differences in decision-making and to identify causal relationships that can explain these differences. Given this, in the next chapter I am ready to return to my sample of interest; Soldiers. Specifically, I used the experimental method outlined here to investigate both predictors of individual difference in military decision-making and to provide an experimental test of my theory of sacred values as it pertains to decision inertia and the ability to commit to least-worst courses of action.

CHAPTER 7: AN EXPERIMENTAL TEST OF MILITARY DECISION-MAKING

It's not hard to make decisions when you know what your values are.

- Roy Disney

Over the past six chapters, I have explored the doctrinal and theoretical perspectives on how Soldiers "should" make decisions. Furthermore, I have collected, and analyzed, qualitative data on Soldiers' recollections of how they made decisions in critical do or don't situations at war. In doing so I have also outlined how I, based on my analysis of the data, believe they make decisions and specifically the role that values and value systems play in their decision-making process. In this chapter, and as the culmination of six chapters of hypothesizing the factors at the heart of the military decision-making process, I present quantitative data that tests how Soldiers make decisions. Specifically, and using the experimental paradigm described in the previous chapter, I explore two distinct aspects of military decision-making. The first aspect I focus on is the degree to which I can identify predictors of "good" decision-makers. I look at known predictors of "good" decision-making elsewhere (NFC and self-reported maximization) and examine how, if at all, these influence military decisions making. The second aspect I focus on is the effect of values and value tradeoff types as a theoretical framework to explain when, and why, some individuals struggle to commit to high-risk choices.

Individual-level analysis of Military Decision-Making

In Chapter 2 I outlined the MDMP from both a doctrinal and theoretical standpoint. Specifically, I looked at how each of these perspectives says that people should navigate the process of option selection. What this chapter did not mention, however, is the science behind what makes a "good" decision-maker rather than a "good" decision. What this means is that I did not touch upon what I know about who, within a sample of Soldiers, would be better able to complete the decision-making process in high-stakes situations and, critically, why. Previous research in behavioral decision-making has highlighted how, for example, maximizers (rather than satisficers) are more prone to indecision (Parker, be

Bruin & Fischhoff, 2007) and that decision avoidance increases as the number and quality of options decrease (Dhar, 1997; Tversky & Shafir, 1992). Furthermore, naturalistic research conducted by Alison has found that individual differences in levels of fluid mental intelligence (Raven, Court & Raven, 1977), and need for closure (Kruglanski et al., 1993) predict the likelihood that an individual, when presented with a least-worst decision, will be prone to decision inertia. Given this, it makes intuitive sense that there will be military decision-makers who are "better" at making least-worst decisions that others, and that psychometric measures can predict improved performance.

Identifying predictors of military performance is a central issue in military psychology (see Laurence & Matthews, 2012 for a full discussion of this). In fact, it was the needs of the Army in World War I which is often viewed as one of the factors that drove the creation of what is currently known as "Industrial/Organizational Psychology" (see Vinchur & Bryan, 2012). During this time, Hugo Münsterberg conducted a series of pioneering studies in support of the selection needs of the United States Army. Münsterberg focused on attention and developed a series of studies to identify telephone and ship operators who appeared better equipped for the task. Not dissimilar to current work in critical incident decision-making, Münsterberg found that telephone operators with experience frequently outperformed those without it. Nowadays, even a cursory glance at the American Psychology Associations' journal *Military Psychology* shows the central interest identifying predictors of good performance. For example, in the last three issues alone, research has been published which focusses on the importance of cortisol, optimism and perseverance in military personnel (Binsch, Wietmarschen & Buick, 2017), well-being in drone operators (Armour & Ross, 2017); vitality during training for Special Forces (Skare, Hopkins & Solberg, 2017); and self-efficacy, grit and psychological flexibility and squad leadership performance (Gilson, Dix & Lochbaum, 2017) just to name a few. Hence, the field of Military Psychology, and of course the Armed Forces themselves, have an active and prolonged interest in identifying those individuals (and their traits) who can consistently and predictively out-perform others in the same situation, given the same task.

Despite this investment in predicting performance, relatively little has been done to focus on what predicts good decision-making at the individual level. For example, in his recent chapter for the Oxford Handbook of Military Psychology, Matthews (2012)

highlights a series of "cognitive" (and non-cognitive factors) in Soldier performance including, intuition and insight. However too often this work relied on discussions of heuristics and biases and discussions of "thinking fast" vs., "thinking slow" (reflecting the known differences between System 1 and System 2 thinking; see Kahneman, 2011). The non-cognitive factors include character strength which was associated with improved outcomes in terms of self-reported bravery, fairness, honesty, persistence, leadership, self-control, and teamwork (Matthews, Peterson & Kelly, 2006). Here then there was a surprising lack of attention paid to the individual styles of personality and decision-making that may affect decision-making in the same way I see in non-military samples (e.g., Alison, Doran, Long, Power & Long, 2013). Wider yet, researchers often opt to look at individual differences in the decision-making process (e.g., building situational awareness) rather than individual differences in the cognitive make-up of the individual (e.g., Strater, Endsley, Pleban & Matthews, 2001).

Here then, prior to testing my theory of value systems in the military decision-making process, I take this opportunity to focus on the role of three different psychometric factors as they pertain to individual differences in the ability of Soldiers to make least-worst decisions. Specifically, and drawing on the findings from critical and major incident psychology I focus on the need for closure, self-reported maximization and experience. I propose the following hypotheses:

Need for Closure (NFC): NFC is the desire to obtain a definite answer to a topic or question, rather than experience confusion and ambiguity (Kruglanski, 1989, p.14). Individuals who score high on NFC limit their cognitive processing and use highly selective search patterns to cope with uncertainty and make fast decisions.

- *H_1 Individuals who are high in NFC will be more resilient to inertia because they will limit their awareness of alternatives and uncertainty (which is high in military operations) in favor of selecting any course of action (good or bad).*

Self-reported maximizing: Maximizers select the option that offers the greatest utility (Simon, 1978). On the other hand, satisficers are happy to select an option that is "good enough."

- *H_2*: *Self-reported maximizers will be more likely to experience decision inertia because they will be continually attempting (i.e., engaging in redundant cognitive deliberation) to find a "better" alternative.*

Experience (and demographic information): Naturalistic decision-making, specifically RPD puts a premium on the role of an individual's experience when making decisions during uncertain situations (see Lipshitz et al., 2001; Klein, 1997). Experience aids situation assessment, option evaluation, and mental simulation of the potential option outcomes (Lipshitz et al., 2001).

- *H_3*: *Those with more experience (measured as both years of service and a previous deployment to a combat zone), will be better decision-makers and more resistant to inertia.*

Tradeoff Type and Decision Inertia

In Chapter 5, I outlined a theory of military decision-making in which the emergence of decision inertia was linked to the presence of sacred values within a given decision-making scenario. In Chapter 6 I then tested this theory with a small sample of participants and found preliminary evidence that when a decision-maker faces a decision that involves more than one sacred value they have a harder time committing to a course of action. In this study, and using the same method as outlined in Chapter 6 and the same participants and same study outlined above I seek to further test this theory of values and military decision-making with a sample of Soldiers. Specifically, in this study I hypothesize that;

H_4: When individuals face decision that involve one sacred value (taboo tradeoffs) they will make decisions faster and report lower decision difficulty

H_5: When individuals face decisions that involve two or more sacred values (toxic tradeoffs) they will make decisions slower and report higher decision difficulty

Method

Participants

Soldiers (n = 39)[4] took part in a simulated study of military decision-making (outlined in full in Chapter 6). Participants were all currently serving members of the United States Armed Forces or enrolled in a formal military college or Reserve Officer Training Program (ROTC). Participants were opportunity sampled through an electronically distributed call for participants. Most participant (84.9%) were male. Participants were aged between 18 and 57 years old (M = 32.66). Participants reflected four of the six major branches of the Armed Forces; Air Force (43.59%, n = 17), Army (41.03%, n = 16), Marines (10.25%, n = 4) and Navy (5.13%, n = 2). Most participants reported that they were in the United States (94.59%, n = 37), two participants were from the United Kingdom (5.41%, n = 2).

Procedure

Participants were invited to take part in an electronic decision-making study which would involve them making a series of least-worst decisions (Appendix H). After clicking the electronic link provided in the call for participants they would be directed to Qualtrics (the website hosting the survey) where they would read, and if in agreement sign, the informed consent. Once this was signed they would complete a demographic questionnaire, the 15-item shortened NFC scale (Roets & Van Hiel, 2011), and Schwartz et al.,'s (2002) 34-item measure of tendency to maximize rather than satisfice. They would then complete the 16 two-step decision-making scenarios outlined in Chapter 6 as well as the modified decision difficulty questionnaire (see Chapter 6) and the Sacred Value Measure (SVM).

[4] This sample of 39 soldiers includes the 5 soldiers who were included in the "pilot" sample for this study.

After completing the study the participants were offered the chance to reflect on which scenarios were most difficult to them. They were then thanked for their participation, offered more information on the study and provided a debrief form which listed relevant helplines and resources in case they suffered any negative consequences from taking part. On average the study took just under one hour to complete (M = 54 minutes 51 seconds, SD = 23 minutes 58 seconds).

Measures

The following dependent variables were used for this analysis;

1. **Situational Awareness Time (SAT):** The amount of time it took the participant to listen to the audio feed outlining the situation and the decision and declare (by progressing onto the next page) that they were "ready" to decide. There are 32 SATs per participant.
2. **Choice time (CT):** The amount of time it took a participant to "choose" an option. This is measured as the amount of time until they recorded their last "click" on an option on the page (Qualtrics recorded both first, last and number of page clicks for each step of the scenario). There are 32 CTs per participant.
3. **Decision Time (DT):** The overall time it took the participant to choose a course of action and commit to it by progressing onto the next page and declaring they are ready to "commit" to their choice. There are 32 DTs per participant.
4. **Commitment Time (ComT):** CT is the time lag between selecting a course of action (CT) and committing to it (DT). ComT, therefore, reflects a period of indecision between selecting a course of action and committing to it. In terms of calculation, simply, ComT = DT – CT. There are 32 ComTs per participant.
5. **Strength of Preference (SP):** Each participant rated, on a likert scale of -5 to 5, which choice they wanted to take. Given this, a simple metric for the strength of preference (1 = weak preference, 5 = strong preference) was created by making all choices positive (so -5 becomes 5, -1 becomes 1 etc.,). There are 32 SP scores per participant.

6. **Decision Difficulty (DD):** As with Chapter 6, participants filled in a decision difficulty measure after completing each scenario. Here, the average score on the decision difficulty measure is calculated (after items 3, 4 and 5 are reverse coded) allowing an overall decision difficulty score to be assigned to that scenario. There are 16 decision difficulty scores per participant.

Hence, in this study 39 participants completed 32 decision points (n = 1248), with each participant providing 32 SATs, DTs, CTs, ComTs, SPs, and 16 DDs.

Results

All participants completed the psychometric and demographic questionnaire. All participants but one (97.43%) completed all 32 decision points (one participant did not complete the 16th scenario however they were included because they had completed 15 full scenarios and decision difficulty questionnaires, they also contacted the researcher to outline that the 16th was not completed because of a technology issue, and not an unwillingness to continue). All 38 remaining participants also completed the sacred values measure. Below I outline the results of their performance and the role of NFC, self-reported maximization and experience.

Overall Performance

Overall, participants took between 7.67 seconds and over two minutes (126.39 seconds, M = 29.79, SD = 16.83) to understand the situation and declare themselves "ready" to decide. In terms of then making these decisions, participants took, on average, just over 6 seconds to decide (M = 6.62 seconds, SD = 9.38). On average, it took them just over 8 seconds to commit to this decision (M = 8.24 seconds, SD = 9.55). The commitment time (the gap between choosing and submitting) was as long as 32 seconds, but averaged just over 1 second (M = 1.72 seconds, SD = 2.56). Overall, being "undecided" about a choice was rare (2.9%) with participants often declaring a choice for preference A or B (97.1%). The strength of preference, overall, was very high (M = 3.92, SD = 1.24). In terms

of decision difficulty, on average, scenarios were viewed as moderately difficult (M = 40.34, SD = 21.20).

Looking at the correlation of the dependent variables (an important metric when I consider more complicated analyses later in this chapter) I can see that there is a high degree of collinearity between them. Looking at the amount of time it took them to choose a course of action; the longer it took them (unsurprisingly) to commit to and submit a course of action ($r(39) = .991$, $p < .0001$). Even more interesting is that the longer it took them to choose a course of action, the longer it took them to commit to that choice (ComT) once they had made it ($r(39) = .826$, $p < .0001$). The longer it took them to choose a course of action, the longer it then took them commit to it ($r(39) = .894$, $p < .0001$). While the findings listed above do not tell us a great deal about decision-making, they give us insight into the overall validity of the study. Specifically, as participants take longer to commit to a course of action the longer it took them to choose and commit to this course of action. Hence, I can see here that reaction times collected as part of this study are predictably, and in the expected direction.

Military vs., non-military scenarios. As stated in Chapter 6, this study uses two different types of decision. Some least-worst decisions are presented within a military setting, while others are presented within a non-military setting. Here I examine the effect of scenario type of participant performance. A series of *t-tests* were used to investigate the effect of scenario type on performance. In terms of decision-making, there was no significant difference in SAT, DT, ComT or CT between military and non-military scenarios ($p > .05$). The mean and mean differences for these comparisons are shown in Table 10. However, there was a significant difference between military and non-military decisions with regards to self-reported decision difficulty ($t(1222) = 11.618$, $p < .0001$) in that military scenarios were viewed as harder (M = 47.91, SD = 19.49) than non-military scenarios (M = 34.44, SD = 20.59). Furthermore, the difference between strengths of preference between military (M = 3.85, SD = 1.277) and non-military (M = 3.97, SD = 1.21) scenarios was approaching significance, and hence, worthy of mention ($t(1238) = -1.705$, $p = .088$).

	Military (n = 540)	**Non-Military (n = 688)**	**Mean Difference**
SAT (seconds)	30.19 (SD = 14.18)	29.48 (SD = 17.92)	0.71
DT (seconds)	7.87 (SD = 11.00)	8.53 (SD = 8.26)	-0.66
CT (seconds)	6.46 (SD = 11.55)	6.74 (SD = 7.27)	-0.28
ComT (seconds)	1.63 (SD = 2.27)	1.78 (SD = 2.77)	-0.15

** = $p < .001$ *** = $p < .0001$

Table 10: Mean differences between SAT, DT, CT and ComT for military and non-military scenarios.

Need for Closure. NFC was measured using the 15-item shortened NFC scale (Roets & Van Hiel, 2011) which here, had a high Cronbach's alpha showing it has good internal consistency ($\alpha = .868$). Overall, participants' NFC levels ranged from 28 to 75 (a full score, $M = 50.74$). To look at the effect of NFC on decision-making, a series of Pearson's correlations were run on the effect of NFC on SAT, DT, CT, ComT, SP and DD. Pearson's correlations showed that NFC was positively correlated with DD ($r(39) = .557$, $p = .0001$). What this means then is that, as NFC increases, so too did the amount of decision difficulty reported by the participant.[5]

The issue with the analysis above however is that it does not factor in the hierarchical nature of the data; and hence, it views all 1248 decisions as independent (implying there are 1248 unique participants). This is an important consideration given that these 1248 decision points stem from 39 individual participants who each bring their own random influences onto the scenario (influences which will equally affect all 32 decisions that they made). In this sense then the data is hierarchical, and the statistical analysis must factor the superordinate level of "participant" into its calculations. Hence, while I am

[5] For all significant correlations, scatterplots are provided in Appendix I to show distribution within the sample.

interested in the "fixed" effect of NFC, I need to control for the "random" effect of each unique participant. Given this, a series of multi-level models (MLMs) were run to test the effect of NFC on participants' decision-making.

MLM is a suitable methodology given that it is well suited to complex surveys/studies, using multistage designs and unequal sampling probabilities (e.g., see Rabe-Hesketh & Skondal, 2006). Here, MLM was conducted using the statistical package STATA. The reason for this is the known issues with conducting MLM with SPSS (Tabachnick & Fidell, 2001). In fact, here, as a test, a sample MLM (with real data from this study) was conducted on SPSS, STATA and the statistical package HLM. While the STATA and HLM results were comparable, the SPSS results were significantly different (reporting a significant result of $p < .001$ while the other packages reported significant levels of .44). Given this, STATA was used for all ensuing MLM models. This is an important consideration given that, as outlined later, there are significant differences in the results of the MLMs when using different statistical packages.

Here then a two-level MLM was used to estimate the main effects of NFC on SAT, DT, CT, ComT, SP, and DD. This MLM was conducted with participants viewed as having both random slopes and random intercepts. Using linear MLM with a maximum likelihood estimator, the effect of NFC on SAT, CT, DT, and ComT were all non-significant ($p > .05$). However, there was a significant, and negative, effect of NFC on strength of preference in which for each one-point increase in the NFC measure accounted for a .024 decrease in the overall strength of their preference ($p < .001$). Furthermore, there was also a significant, and positive effect of NFC on decision difficulty, with each unit increase in NFC accounting for a .64 increase in reported decision difficulty ($p < .0001$).

Given the above effect of scenario type on strength of preference and decision difficulty, and to further explore the effects of NFC on decision-making, scenario type (military vs., non-military) was also factored into the model as a fixed effect. This also allowed the interaction of NFC and scenario type to be explored within the six DVs. Given that overall, there was no significant effect of NFC on SAT, DT, CT, or ComT, these DVs were not analyzed. Here, MLM showed that when factoring in both scenario type and NFC there was an approaching significant, and significant (and negative) effect of both NFC ($\beta = -.121$, $p = .056$) and scenario type NFC ($\beta = -.024$, $p = .001$) on strength of preference.

Furthermore, there was also a significant interaction between NFC and scenario type (p = .020). Given this, two independent two-level MLMs were run looking at both military and non-military scenarios independently. Within non-military scenarios, there was a significant positive effect of NFC on decision difficulty, in which each unit increase in NFC accounted for a .71 increase in decision difficulty ($p < .0001$). When looking at the military scenarios, however, while the nature of the relationship (and β coefficient) was still negative, the relationship was less pronounced, with each unit increase in NFC only accounting for a .54 increase in decision difficulty. When looking at the three-level MLM model of NFC, scenario type and strength of preference, while the effect of NFC on strength of preference was still significant (and negative) while factoring in scenario type (β = -.021, p = .007), neither the effect of scenario type was significant, nor was there a significant interaction between scenario type and NFC ($p > .05$).

Overall then, when looking at NFC, the data does not support H_1 (that those who are high in NFC are better decision-makers) because those high in NFC did not decide faster, and they did not commit to decisions faster. Instead, those high in NFC found the decisions here harder to make, especially when those decisions were in a non-military setting.

Self-reported Maximization. The Schwartz et al. (2002) 34-item measure of tendency to maximize rather than satisfice was used to assess participants' need to maximize a situation. Here, the overall Cronbach's alpha for the measure was high (α = .847). It was also high for each of the three subcomponents within the measure (Satisficing α = .718; Decision Difficulty α = .871; Alternative Search α = .871). Furthermore, each of the three subcomponents was significantly and positively correlated with the overall score (Satisficing; $r(39) = .383$, $p < .0001$: Decision Difficulty; $r(39) = .655$, $p < .0001$: Alternative Search $r(39) = .850$, $p < .0001$). Given this, and the fact that the Cronbach's alpha did not significantly increase with the exclusion from any factors within it, for all ensuing analyses the overall score from the 34-item measure was used rather than using analyzing each original subcomponent.

A series of two-level MLMs were run with participant ID as a superordinate level factor and maximization as a fixed effect. Here, MLM found that, while still positive, the

effect of maximization on SAT, DT, CT, ComT, Strength of preference and DD were all non-significant ($p > .05$).[6] Given this, I cannot confidently provide support for H_2 (see also footnote 4).

Experience. Experience ranged within the participants from 0 years (those enrolled in a ROTC) to 36 years (M = 10.5 years). Almost half of the participants (48.71%, n = 19) had been deployed to a theater of conflict. To investigate the effect of experience, I operationalized this variable in two ways; the first was to view experience in terms of years of service, while the second is to view experience as binary relating to whether the Soldier has, or has not, been deployed to a theater of conflict.

In terms of the number of years of experience, Pearson's correlation found that overall years of experience was significantly positively correlated with CT ($r(39) = .377$, $p = .018$), and DT ($r(39) = .364$, $p < .023$). To explore the effect of experience, a series of independent samples t-tests showed that there were significant difference between those who had been deployed in terms of their SAT ($t(1180.41) = -3.265$, $p = .001$), CT ($t(801.23) = -4.930$, $p < .0001$), DT ($t(801.28) = -5.808$, $p < .0001$), ComT ($t(773.69) = -4.969$, $p < .0001$) and DD ($t(1185.57) = -3.776$, $p < .0001$). Differences in strength of preference were also approaching significance ($t(1194.46) = 1.898$, $p = .058$). The mean differences are displayed in Table 11. Hence, when I operationalize "experience" as a binary variable of deployment, Soldiers who have deployed were slower to assess the situation, make a choice, commit to that choice, showed a great commitment time (the gap between selecting and committing). They also showed weaker strengths of preference and found the decisions harder.

[6] However, it is perhaps worth mentioning that when the same MLMs were run using SPSS, there was a significant effect of self-reported maximization on SA, DT, CT, and DD. Meaning that if we used SPSS we would be stating that maximization did significantly decrease decision-making speed while increasing decision difficulty. While here we shall base our findings on the results from STATA it is important to highlight the dependence of these statistical outcomes on the statistical program used.

	Not Deployed (n = 602)	**Deployed (n = 596)**	**Mean Difference**
SAT (seconds)	28.07 (SD = 15.16)	31.10 (SD = 16.81)	*-3.23***
DT (seconds)	6.69 (SD = 5.08)	9.87 (SD = 12.49)	*-3.18****
CT (seconds)	5.32 (SD = 4.84)	7.98 (SD = 12.38)	*-2.66****
ComT (seconds)	1.36 (SD = 1.28)	2.09 (SD = 3.41)	*-0.73****
SP	4.04 (SD = 1.14)	3.90 (SD = 1.25)	0.14
DD	37.56 (SD = 20.02)	42.14 (SD = 21.86)	*-4.58****

** = $p < .001$ *** = $p < .0001$

Table 11: Mean differences in SAT, DT, CT, ComT, SP and DD between those participants who had been deployed to a theater of conflict, and those who had not.

Again, to control for the effect of participant, a series of MLM were run using experience as a continuous variable (years of service) and then with deployment as a binary variable (three-level and interaction effect was also then modelled). MLM found that, when controlling for the random effects of each participant, years of experience had a positive effect on SAT, with each year of experience accounting for a .22 second slower SAT (p = .005). The effect of experience on CT was also approaching significance (p = .069), with each unit increase in experience accounting for a .13 second increase in the amount of time it took them to decide upon a course of action. Again, the effect of experience on the amount of time it took a participant to submit a decision was also approaching significance and positive (β = .167, p = .057). When using a two-level MLM there was no significant effect of experience on ComT (β = .034, p = .145), strength of preference (β = -.0013, p = .897) or decision difficulty (β = .224, p = .346).

When looking at the effect of a deployment using a two-level MLM, there was a significant and positive effect of a deployment on SAT ($\beta = .219$, $p = .031$). There was no significant effect of a deployment on DT, CT, ComT, SP or DD ($p > .05$). Given that both experience and a deployment have a significant effect on SA, both metrics of experience were factored into a two-level MLM, however there was no significant interaction between overall experience, a combat deployment, and SAT.

Overall then I not only reject H_3 but have identified the opposite effect to what I predicted. Rather than experience *increasing* decision ability (in terms of time taken to choose a course of action and a resistance to inertia), those who had more experience (and those who had deployed to a theater of conflict) were slower to assess the situation, to choose an option, and to commit to that option. They also showed a general lower commitment to their choices and reported that they found the decisions harder to make (though these last two effects disappeared when I controlled for the effect of participant).

Sacred Values

Overall, and as expected based on my analysis from Chapter 5, "protecting the lives of people under their command" (M =17.92, SD = 5.75) and "protecting the lives of fellow Soldiers" was the most sacred value to my Soldier sample (M =17.5, SD = 4.47). Overall, the SVM scores for each of the 11 values measured are shown in Table 12. When assigning which values were sacred to an individual, the same method as outlined in Chapter 6 was used here, in which a value was determined sacred if the score for that value was 1 standard deviation above the average score for all 11 values. Within this sample the average number of sacred values per participant was 2 (M = 2.15, SD = 0.71, *Mode* = 2, *Median* = 2). Once again, sacred values were well dispersed within the sample, with each value, on average, being "sacred" to only 7 participants (M = 7.54, SD = 5.86). The value that was most often sacred to the participant were "protecting the life of people under my command" which was sacred for 48.71% of the sample (n = 19). The next values which were most often designated as sacred were "acting within the law" (38.46% of the sample, n = 15) and protecting the life of a fellow Soldier (33.33% of the sample, n = 13). Every value was designated as sacred for at least one participant.

Value	Average SVM Score *(4 – 28)*
Protecting the life of people under my command	17.92
Protecting the life of a fellow Soldier	17.50
Protecting the life of a civilian	17.15
Everyone's right to free will	16.81
Act within the law	16.13
Completing the mission	14.63
Obey the orders of a superior	13.94
Pursue a known enemy	13.55
Avoid negative consequences for my actions	12.31
Avoid blame for my actions	11.89
Need to exert authority over others	10.34

Table 12: Value importance, as rated by the SVM.

To explore the effect of value strength (in general) on decision-making, for all participants I calculated a value strength score (the average value score across all 11 values). Pearson's correlation found that, while the overall strength of values did not significantly correlate with SAT, CT, or DT ($p > .05$). Furthermore, those who had deployed had higher strengths of values ($M = 15.08$, $SD = 2.88$) than those who have not deployed ($M = 14.37$, $SD = 4.21$). An independent samples t-test showed that this relationship was significant ($t(1010.95) = -3.324$, $p = .001$). MLM controlling for participant as a nested variable found a significant and positive effect of deployment on the strength of an individual's value system ($\beta = .702$, $p = .001$) and experience, with every year increase in service length accounting for a .03 increase in overall value system strength ($\beta = .028$, $p = .023$).

Tradeoff Type and Decision Inertia

To explore the effects of tradeoff type on decision-making, based on which values were sacred to each participant, each participants' 32 decisions were reclassified as either

routine (meaning it involved no sacred values), taboo (meaning it involved one sacred value) or toxic (meaning it involved two or more sacred value). Using this new classification, I could explore the effect of tradeoff type on decision-making. Overall, within the total number of decisions (n = 1216) toxic tradeoffs were the rarest (6.83% n = 83), while taboo (39.39%, n = 478) and routine (53.78%, n = 654) tradeoffs were far more common. This is an important consideration as I move towards nested analysis. Overall, across the sample and independent of the participant, toxic tradeoffs do not seem harder to make, or indeed harder at all. Specifically, Figure 6 shows the comparison of taboo, toxic and routine tradeoffs in terms of SAT, DT, CT, and ComT.

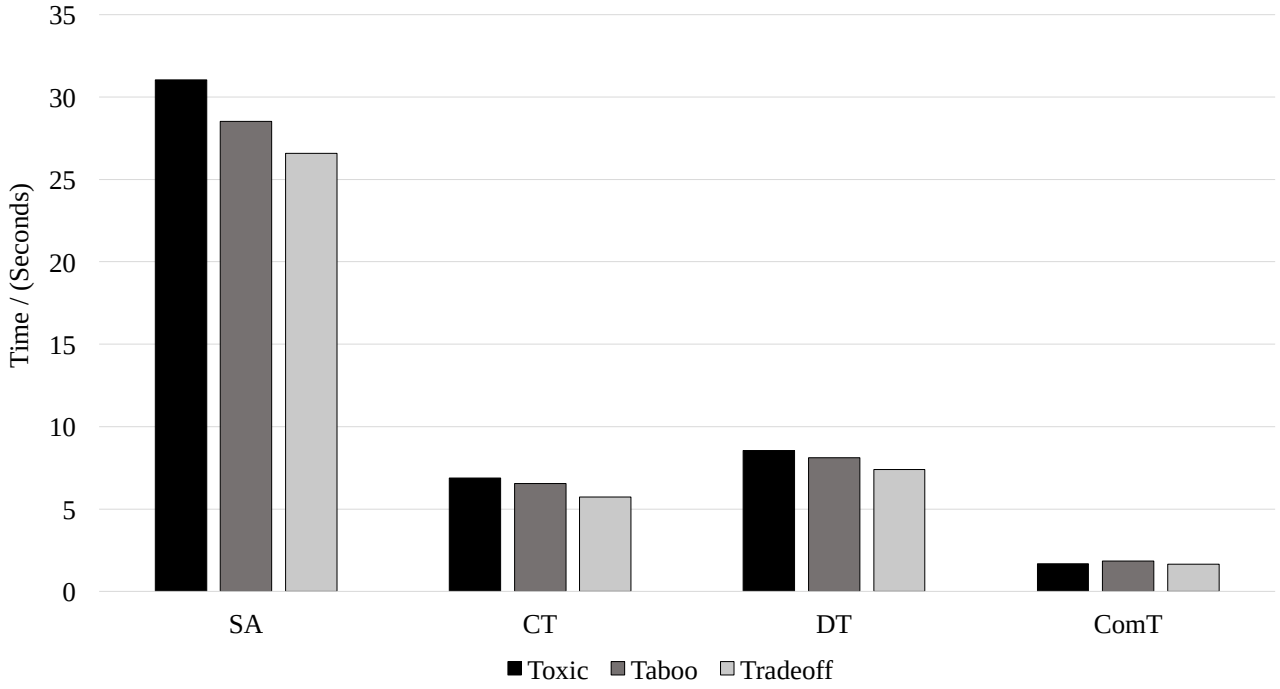

Figure 6: Tradeoff type and situational awareness timing, overall decision timing, and choice commitment timing.

In Figure 6 then we can see that participants' SAT was slowest for routine tradeoffs (*M* = 31.04, *SD* = 17.71) than for taboo (*M* = 28.53, *SD* = 14.63) and toxic tradeoffs (*M* = 26.59, *SD* = 13.57). In addition, they were also slower to make and submit decisions for routine tradeoffs (CT *M* = 6.89, *SD* = 10.15, DT *M* = 8.56, *SD* = 10.70) than for taboo (CT

M = 6.54, *SD* = 8.98, DT *M* = 8.11, *SD* = 8.35) and toxic tradeoffs (CT *M* = 5.73, *SD* = 6.48, DT *M* = 7.40, *SD* = 7.87).

To further explore this relationship, while controlling for the effect each individual participant, a series of MLM models were run, including tradeoff type as a dependent variable while controlling for the random effects of each participant. Here, MLM found that the SAT for taboo tradeoffs was significantly slower than routine tradeoffs (β = -2.29, *p* = .019), and the slower SAT for routine tradeoffs, when compared to toxic tradeoffs, was also approaching significance (β = -3.39, *p* = .0.076). When looking at the difference between taboo, routine, and toxic tradeoffs in terms of DT, MLM showed that while DT for both taboo and (β = -.27) toxic tradeoffs (β = -.59) are faster than routine, this was non-significant (*p* > .05). Overall, there was no significant effect between tradeoff type and CT, ComT, and strength of preference when controlling for the participant. However, MLM found that there was a significant positive relationship between taboo and routine tradeoffs in terms of decision difficulty, with taboo tradeoffs being viewed over 4 points more difficult than routine tradeoffs (β = 4.76, *p* < .0001).

While the results here do not entirely reject the role of values in predicting decision-making and decision inertia (we come to this in the next chapter). They do not provide support for my theory that tradeoff types can predict indecision and decision difficulty, because here, and contrary to my hypotheses, toxic tradeoffs were not judged as significantly harder than routine or taboo tradeoffs, nor were participants slower to make decisions when facing taboo tradeoffs. That said, I did find an interesting relationship in that those who had stronger value systems overall did show higher levels of inertia. Furthermore, those that had been deployed showed stronger value systems.

Discussion

Military Decision Making

Here then I have shown preliminary evidence for individual markers of "good" decision-makers. Now, in this chapter I operationalized "good" as avoidant of inertia, and this may explain why so many of the findings appear counter-intuitive (and at the very least counter to my expectations). It is widely known, and well reported, for example, that

experience aids decision-making in that experts are better able to assess the situation, see patterns within it and identify applicable courses of action (see Endsley, 2006). Here, on the other hand expertise had the opposite effect in that they were slower. This is an important distinction to make because it likely lies in the methodological paradigm I used; specifically, I used a very "closed" experimental design in which participants were forced to choose between two options (repeatedly) and made decisions, on average, within 6 seconds. In most of the research that has focused on the role of expertise, experimental paradigms are more open allowing them more room to maneuverer the situation, make a positive impact and construct their own courses of action. This is an important consideration, as by taking this into account I can avoid making overly-hasty claims about the negative implications of expertise (something which would go widely against one of the most established findings in decision-making research).

That said, the experiment above did show a series of individual predictors of performance that, within a Soldier sample, related to differing abilities to navigate this series of least-worst decisions. First and foremost, and counter to a significant body of research, NFC appeared to have a negative effect. NFC - the need to settle for *any* answer, rather than sustaining ambiguity (Kruglanski, 1989; Kruglanski & Webster, 1996) - is hence closely linked with decisiveness and "jumping to conclusions bias" (McKay, Langdon, & Coltheart, 2006). It makes sense, therefore, to hypothesize that individuals high in NFC should be faster decision-makers due to a lack of wanting to tolerate uncertainty by deciding between options. Instead however, I found the reverse, with NFC being linked to a slowing of the SA phase of decision-making (the "what is going on phase"). They also reported finding decisions more difficult. Despite the high interest in both SA and NFC, no research to date (that the author knows of at least) has specifically tested the role of NFC on SA and how SA processes differ between those with high and low NFC. Yet, despite this, given the definition of NFC above and what is known about its wider effect on decision-making, it is counter-intuitive that it should *increase* the SA phase of decision-making. In a similar vein, the findings that those with high NFC reported increased decision difficulty and weaker strengths of preference also runs in the face of what is the extant knowledge of those high in NFC. What is more interesting still is the fact that this appears to also be domain specific, in that the effect of NFC on strength of

preference was more pronounced in non-military scenarios than military scenarios. Overall, while it is important now to draw too strong conclusions between research findings which force a participant to choose between two options and those that afford the participant a more active role within the environment (as is common in most NDM research), the findings support that NFC still plays an important and unique role in decision-making, despite it not being in the predicted direction.

The second variable I investigated was self-reported maximization. As reported by Parker, Bruine De Bruin and Fischhoff (2007), those who are self-reported maximizers have trouble satisficing within a given situation and instead try to maximize the options available to them. It is logical then that maximization is strongly associated with decision inertia. The results here show promise, but I would recommend further research. The issue here is the instability of the results depending on the statistical program used. While correlation analysis showed a strong, significant and hypothesized relationship between maximization and a general slowing of the decision process, once the hierarchical nature of the data was factored in these relationships largely disappeared, however, as outlined in footnote 4, when the same analyses were run in SPSS rather than STATA, all effects remained significant. This, at the very least warrants further analysis to isolate the unique effect of maximization. Regardless, the results here do show that maximization may be an important factor in predicting individual differences in decision-making. This is especially important given that, to date, no research has explored the utility of self-reported maximization as a scale to predict performance in military decision-making tasks.

Finally, this study looked at experience, which, as mentioned above, is usually strongly associated with good decision-making. As outlined in Chapter 2, isolating and understanding the role of experience in expert performance is one of the cornerstones of modern NDM research. Here, however, I found that experience has an interesting effect on decision-making in that both when I looked at experience as a continuous variable (years in service) and as a binary variable (being deployed to a theater of conflict), both were linked to a general slowing of the decision-making process. Here again, it would be easy to not only reject hypothesis 3 (that those with more experience are more resistant to inertia), but to reverse it, however there is an important counter-point to raise. When looking at decision inertia, and decision-making in general, it is important to identify that

there is often an "optimum" time to act, which is not too soon, and not too late. In my interviews from Chapter 5 and 6, this was often referred to as "rushing to failure". Perhaps what we are seeing here is a lack of "rushing to failure" which within a time-based forced choice experimental paradigm is manifesting as a slowing of the decision-making process (specifically their SAT). Further work is needed here to flesh out the degree to which their decision-making is slowed vs., more deliberate. Again, as mentioned before this may also be a methodological manifestation from "forcing" choice on a passive participant rather than allowing them to explore their environment, assess the situation and propose their own courses of action, during which, arguably, the positive effects of expertise would come to the fore.

Despite the reverse effects of several of our variables (NFC and experience) what this study has shown is that there are unique correlates of military decision-making which can be used to predict individual differences in performance. While each of the factors here requires further research to identify both the true extent of their impact and how closely they are tied to inertia (vs., a more deliberate and adaptive decision-making strategy), this research shows great promise in terms of identifying predictors of performance. To date, very little research has sought to isolate the role of NFC and maximization as they pertain specifically to military decision-making. Here, at the very least, I have provided a strong case for a future focus on these variables.

Sacred Values and Decision Inertia

Once again, the findings here did not support my hypotheses. First and foremost, in rejection of H_4 and H_5, when participants faced tradeoffs that involved only one sacred value they did not make decisions faster, nor did they find them easier than decisions with no, or two sacred values. In addition to this, when participants faced tradeoffs which involved two sacred values they did not report higher decision difficulty, or make decisions slower than when they faced one, or no sacred values.

That said, I did find some support for H_5 in that while taboo tradeoffs were viewed as more difficult that routine or toxic tradeoffs (the latter being contrary to H_5) taboo decisions were made faster that routine and toxic decisions. What this implies is that while

participants found the decision harder (perhaps due to the presence of a sacred value) they could quickly decide upon a course of action. Despite this minor support for Tetlock (2003) and my own theory, what is glaring in the analysis is the lack of support for H_3 in that toxic tradeoffs were not viewed as harder, decisions were not made slower and participants did not take longer to commit to a course of action. These findings are inconsistent with the majority (albeit small number) of studies that have previously examined tradeoff types and decision-making (namely Duc et al., 2013; Hanselmann & Tanner, 2008).

There is one potential reason for this and it is, unfortunately, methodological. Specifically, it is arguable that given the uncertainty inherent in the scenarios (an essential part given that they seek to reflect military decision-making) the values involved are also, to a degree, uncertain. This, in turn, opens the door for the participant to bring their own subjective interpretation of values within the situation to the fore. This is perhaps reflected by the low Jaccard's coefficient reported in Chapter 6 (.28; meaning that the two reviewers agreed with each other 28% of the time). What this means is that, perhaps only the participant can identify which values are, to them, involved in each decision. This provides a potential methodological tweak (the self-nomination of values) which could be used in future research. One of the defining aspects of "sacred" values is the degree to which they are personal, and hence, externally assigning what values *we* think are involved in a scenario may eliminate the highly personal nature of values. These issues are also compounded by the fact that toxic tradeoffs overall were quite rare and not evenly distributed throughout the scenarios meaning that, perhaps, the non-random effects of certain scenarios could also be compounding the results. Specifically, there were five decision points (15.62%) which were not classified as toxic for any participant, and eight decision points were classified as "toxic" for only one (25.00%).

Despite the lack of effect for tradeoff type on overall decision-making, there was a very interesting effect of overall value strength, and specifically, how this related to experience. Overall, I found that when Soldiers, in general, had stronger value systems (here viewed as an overall higher score on the SVM across all values) they were slower to commit to their decisions (our metric for inertia). What is especially interesting here is both the correlation of value system strength with experience, and the fact that those with high value systems showed a slowing of the decision-making process that was not dissimilar to

the performance of those with higher experience. The results here show that those individuals who have more experience, and especially those who have deployed, seem to have a stronger set of values and this, in turn, seems to hinder them from committing to decisions. This finding then, and irrespective of our ability to precisely pinpoint the nature of values at play within a given scenario in this experiment, does emphasize the importance of considering values as an important predictor of decision-making. Furthermore, it provides a new lens through which I can consider the role of expertise in naturalistic decision-making in that not only does it play an essential role in SA and course of action development, but with experience (perhaps) comes a more engrained value system which can be relied upon and used to navigate complex least-worst decisions. To better understand this role of value systems in both a domain-specific and domain-general context, in the next chapter I compare values and decision-making between three unique populations; Soldiers, police officers and undergraduate students.

In Chapter 5 I proposed two general hypotheses about Soldier decision-making which, if my theory of values was correct, would have emerged within the data. Specifically, I hypothesized that;

1. Value systems predict the occurrence of decision inertia in least-worst situations
2. Choices will be harder to make when they involve two (or more) sacred values.

Here, I provided mixed support for these hypotheses. While I did find some support for the link between value systems and inertia, this link was more correlational than complex, with overall increases in value systems being linked to a general slowing of the decision-making process, rather than it being specifically focused on the types of tradeoffs that exist within the decision itself. Hence, while I could not provide support for the effect of tradeoff types I did provide support for the view that, overall, value systems are an important consideration in military least-worst decision-making.

Conclusion

This chapter sought to provide an experimental test of military decision-making. I aimed to identify predictors of individual difference within military samples as well as the role of values. While my results did not support my hypotheses in many cases I identified several unique relationships between personality factors (NFC and maximization) and decision-making. Furthermore, I identified a series of interesting and counter-intuitive findings with regards to the effect of experience. By then looking at the underlying value systems of the participants I then further expanded on this relationship by identifying an inter-relation between experience and value systems. This finding offers great promise and in the next chapter I seek to further explore it by integrating two new samples into my analysis as comparison points to compare Soldiers' decision-making and value systems.

CHAPTER 8: TINKER, TAILOR, SOLDIER, SPY: COMPARING MILITARY AND NON-MILITARY DECISION-MAKING.

There is nothing like a Soldier.

- Anon, Project Afghan (2012)

At the start of this thesis I focused on decision inertia; the psychological process of actively attempting to choose a course of action but failing to do so. In Chapters 1, 2 and 3 I sought to outline the concept of inertia, the factors associated with the emergence of inertia and why inertia is a real and valid phenomenon that is likely to emerge within the military decision-making process. In Chapters 4 and 5 I then sought to identify and explain the emergence of inertia within the military decision-making process by collecting data from Soldiers about times during which they had faced a least-worst decision (from which inertia can commonly emerge; Alison et al., 2015). The issue, however, was that in my interviews inertia rarely emerged. When recalling the least-worst decision they faced my participants showed that often they remained able to effectively weigh options, identify a preferred course of action and commit to it despite the negative consequences that could be associated with that course of action. This was counter to my expectations, and based on this finding I sought in (Chapters 6 and 7) to understand the process behind this ability to – while tolerating uncertainty, potentially negative outcomes, accountability, and blame - decide. So, while seeking to explore the processes that underlie choice selection within military personnel what I became interested in is what might separate military personnel from their non-military counterparts; what I want to explore is whether there is something *unique* within the Soldier sample that leads to a domain-general ability to make least-worst decisions. Here then, and as the final experimental chapter of this thesis, I seek to compare military decision-makers with non-military decision-makers. In addition, I segregate the non-military decision-makers into those who operate in environments like the military (i.e., police officers), and those who do not operate in those environments (i.e., student participants at a local University).

In Chapter 4 I made several assertions about why Soldiers may be more resistant to inertia:

1. Individuals who enter the Armed Forces have individual differences in decision-making styles compared to those who do not join the Armed Forces. It is well known that individuals differ in their decision-making styles (e.g., a need to maximize, vs., a willingness to satisfice) and that this correlates with differing ability to avoid decisions (Parker, De Bruin & Fischhoff, 2007).
2. Individuals become more resilient to inertia because of extensive training in decision-making and develop a domain-general ability to make critical time-sensitive decisions.
3. The environment within which decisions are made (namely "at war") alter the degree to which external pressures (such as accountability) are felt, preventing such factors from derailing decision-making. Research from social psychology has extensively shown that individuals are affected by the situation, and often behave in situation-relevant ways (e.g., Zimbardo, 1969). Given this, it is possible that the military environment creates social expectations for swift and decisive action.

Based on these assertions I was then able to propose the following hypotheses:

H_1: If we accept assertion 1 then Soldiers and members of the Emergency services will significantly differ on several, relevant, personality and decision-making metricizes.

H_2: If we accept assertion 2 then Soldiers will outperform members of the Emergency services in all least-worst situations because of an improved decision-making style because training increases resilience to inertia by developing a domain-general ability to make critical time-sensitive decisions.

H_3: If we accept assertion 3 then members of the emergency services and Soldiers will all be more resistant to inertia when making military decisions vs., making least-worst decisions in a non-military setting.

In addition to this, one untested hypothesis from Chapter 5 remains;

> H_4: Because Soldiers show less inertia, they have stronger value hierarchy than those who become inert (namely members of the emergency services). This means that, more often, a decision involves only one sacred value.

It is these remaining hypotheses that I will test in this chapter.

Methods

Participants

In addition to the 39 Soldiers who took part in this study in Chapter 7, two further samples were collected. Firstly, a sample of police officers was recruited from the United Kingdom. These police officers were offered the opportunity to take part in this study as part of a training event being hosted by Prof. Alison. In return for participating in this study, officers were offered the opportunity to receive a personalized outline of their decision-making and how their choices compared with their police counterparts. Overall, 23 police officers took part in this study. All police officers were based in the United Kingdom (100.00%, n = 27). Just over half of the participants were male (60.89%, n = 14) with the remaining 39.11% being female (n = 9). Participants ranged in age from 38 to 54 (M = 44. 95). It is important to mention that a further 13 members of overall sample reported being a police officer, however, these 13 had also served in the United States (n = 10) and United Kingdom (n = 3) Armed Forces. Given that the independent variables are relatively stable personality factors these individuals were classified as Soldiers (that said I do acknowledge the potential "hybridity" of this group). In addition to the police sample a control sample of students at the University of Massachusetts Lowell (UML) was recruited for this study. Overall 38 students at UML took part in this study. Students were offered course credit in return for their participation. Student ages ranged from 19 to 67 (M = 26, 68), but they were relatively young overall (*Median* = 22, *Mode* = 22). Even though these two additional

groups were recruited in diverse ways, and under different circumstances, all participants completed the study in the same situation (i.e., independently, away from "the lab", on their own computer and at a time and place of their choosing). Overall then, this study had 100 participants including 39 Soldiers, 23 members of the police force and 38 undergraduate students at UML. While I acknowledge that this is not a mixed sample, given the fact that these are relatively unique and often hard to access samples (the Soldiers and police officers, not the students), the samples were not matched to increase the overall "n" of each sample. This was done with a view to increase the overall statistical power of any ensuing analysis.

Procedure

As with Chapters 6 and 7, each participant was sent a call for recruitment which contained a link to the Qualtrics-hosted study. After clicking the electronic link provided in the call for participants they would be directed to Qualtrics (the website hosting the survey) where they would read, and if in agreement sign, the informed consent. Once this was signed they would complete a demographic questionnaire, the 15-item shortened NFC scale (Roets & Van Hiel, 2011), and Schwartz et al.'s (2002) 34-item measure of tendency to maximize rather than satisfice. They would then complete the 16 two-step decision-making scenarios outlined in Chapter 6 as well as the modified decision difficulty questionnaire (see Chapter 6) and the Sacred Value Measure (SVM). After completing the study the participants were offered the chance to reflect on which scenarios were most difficult to them. They were then thanked for their participation, offered more information on the study and provided a debrief form which listed relevant helplines and resources in case they suffered any negative consequences from taking part. On average the study took just under one hour to complete (M = 57 minutes 29 seconds, SD = 25 minutes 58 seconds).

Measures

As outlined in chapter seven, this research used the following dependent variables;

1. **Situational Awareness Time (SAT):** The amount of time it took the participant to listen to the audio feed outlining the situation and the decision and declare (by progressing onto the next page) that they were "ready" to decide. There are 32 SATs per participant.
2. **Choice time (CT):** The amount of time it took a participant to "choose" an option. This is measured as the amount of time until they recorded their last "click" on an option on the page (Qualtrics recorded both first, last and number of page clicks for each step of the scenario). There are 32 CTs per participant.
3. **Decision Time (DT):** The overall time it took the participant to choose a course of action and commit to it by progressing onto the next page and declaring they are ready to "commit" to their choice. There are 32 DTs per participant.
4. **Commitment Time (ComT):** CT is the time lag between selecting a course of action (CT) and committing to it (DT). ComT, therefore, reflects a period of indecision between selecting a course of action and committing to it. In terms of calculation, simply, ComT = DT – CT. There are 32 ComTs per participant.
5. **Strength of Preference (SP):** Each participant rated, on a likert scale of -5 to 5, which choice they wanted to take. Given this, a simple metric of the strength of preference (1 = weak preference, 5 = strong preference) was created by making all choices positive (so -5 becomes 5, -1 becomes 1 etc.,). There are 32 SP scores per participant.
6. **Decision Difficulty (DD):** As with Chapter 6, participants filled in a decision difficulty measure after completing each scenario. Here, the average score on the decision difficulty measure is calculated (after items 3, 4 and 5 are reverse coded) allowing an overall decision difficulty score to be assigned to that scenario. There are 16 decision difficulty scores per participant.

In this study, each participant completed 32 decision points (n = 3200) with 1248 decision points for the Soldier sample, 736 decision points for the police sample and 1216 decision points for the UML student sample. Overall, this provides a dataset of 3200 SATs, DTs, CTs, ComTs, SPs, and 1600 DDs (a total of 20,800 unique data points).

Results

Before outlining the results of the four hypotheses, it is important that I look at the general trends when all samples are viewed as one. This is especially important as it may provide insight into which facets of least-worst decision-making (maximization, NFC etc.,) are universal, helping us later build theories that span outside of my myopic focus on military decision-making and towards more general theories of decision-making.

Overall Performance

On average, across the samples, participants took between 7.67 and 128 seconds to assess the situation and to declare themselves "ready" to decide (M = 30.17 seconds, SD = 16.59 seconds). It then took them, on average, 6 seconds (M = 6.80 seconds, SD = 6.89 seconds) to decide upon a course of action and just over 8 seconds to submit that decision (M = 8.37 seconds, SD = 7.34 seconds). The commitment time (the gap between choosing and submitting) was up to 33 seconds but averaged just over 1 second (M = 1.57 seconds, SD = 1.97 seconds). Overall participants found the scenarios to be relatively difficult (M = 43.83, SD = 21.43). Again, as seen in Chapter 7, participants were rarely "undecided" on a course of action (6.3%), and usually committed (in varying degrees) to option A or B (92.6%). The strength of preference, was, on average, high (M = 3.58, SD = 1.49).

Looking at the inter-correlation of dependent variables, the longer participants took to choose a course of action (CT), the longer they took to decide (DT; $r(100) = .968$, $p < .0001$) and to commit to it (ComT; $r(100) = .370$, $p < .0001$). Decision time (DT) was also positively correlated with commitment time (ComT; $r(100) = .590$, $p < .0001$). Interestingly, CT was negatively correlated with SP, meaning that the longer they took to choose, the less confident they were in their choice (SP; $r(100) = -.207$, $p = .039$). Finally, SP was negatively correlated with DD, so as decisions became more difficulty, participants were less confident in their choices/showed a decreased preference for A or B ($r(100) = -.545$, $p < .0001$). Again, what this shows is that overall there is internal validity within the scenarios and DVs in that, as participants found decisions harder to make, their decision-

making was slowed, they took longer to make a choice, paused more before committing to it, and generally showed a weaker preference for that choice.

Need for closure. NFC was measured using the 15-item shortened NFC scale (Roets & Van Hiel, 2011) which here, had a high Cronbach's alpha showing it has good internal consistency (α = .863). Overall, participants' NFC levels ranged from 28 to 75 (a full score, M = 51.18). When viewing decisions points as independent Pearson's correlation found that NFC was not correlated with any decision-related DVs (SAT, CT, DT, ComT $p > .05$). NFC was however significantly negatively correlated with SP ($r(100) = -.408$, $p < .0001$) and positively correlated with DD ($r(100) = .521$, $p < .0001$). Hence, as NFC increased their strength of preference decreased, and the self-reported decision difficulty increased. MLM confirmed these findings, showing that as NFC increased, SP decreased by .02 for each choice ($\beta = -.027$, $p < .0001$), and that as NFC increased, self-reported DD increased ($\beta = .58$, $p < .0001$). Hence, overall NFC once again does not directly predict decision-making performance in terms of speed or inertia, but it does seem related to the overall confidence of the decision-maker, and their perception of decision difficulty.

Self-Reported Maximization. The Schwartz et al. (2002) 34-item measure of tendency to maximize rather than satisfice was used to assess participants need to maximize a situation. Here, the overall Cronbach's alpha for the measure was high (α = .874). It was also high for each of the three subcomponents within the measure (Satisficing α = .753; Decision Difficulty α = .859; Alternative Search α = .901). Furthermore, each of the three subcomponents was significantly, and positively correlated with the overall score (Satisficing; $r(100) = .321$, $p < .0001$: Decision Difficulty; $r(100) = .726$, $p < .0001$: Alternative Search; $r(100) = .883$, $p < .0001$). Given this, the full version of the maximization scale was used and no analyses were run using specific subcomponents of the measure. Overall, SP was negatively correlated with maximization ($r(100) = -.346$, $p < .0001$), while maximization was positively correlated with decision difficulty ($r(100) = .319$, $p = .0001$). MLM confirmed the relationship between maximization and SP, in that for every point increase in maximization there is a decrease in the overall strength of

preference shown (β = -.014, $p < .0001$). There is also a significant and positive effect of maximization on decision difficulty (β = .262, $p < .0001$).

Sacred Values. In Chapter 7 I found that the overall strength of someone's value system (the average value score across all 11 values within the SVM) affected their decision-making. Overall, when using MLM, I found that value systems are significantly negatively associated with the strength of preference (β = .262, $p < .0001$). Strength of Value Systems was not, otherwise, significantly associated with SA, DT, CT, ComT, SP or DD.

Overall Findings

Overall then, when looking at the total subject group several interesting findings emerge. Firstly, when looking at DVs associated with decision-making (SAT, DT, CT, and ComT), while there are many trends within the data that seem related to individual factors (NFC and maximization) there is so much inter-individual variation that when the analyses control for the random effect of the participant, these differences largely disappear. Instead, the effect of NFC and maximization was not reflected in the speed of decision-making, but instead appeared to be reflected in confidence and self-reported difficulty, with both NFC and maximization increasing decision difficulty, and decreasing strength of preference. Experience again showed a similar effect to previous chapters in that while it was correlated with CT and DT, when factoring in the participant, the effect of experience most prevalent on decision difficulty, with those who have high experience reporting that the decisions were harder. While many of these general findings mirror the findings from the analysis of just Soldiers (the overall negative effect of NFC, maximization and experience) below I begin to parse out the unique factors within each of the samples. Specifically, I test the four hypotheses proposed at the beginning of this chapter.

H_1: Soldiers and members of the emergency services will significantly differ on several, relevant, personality and decision-making metricizes.

Overall, I can provide some support for H_1. First and foremost an independent samples ANOVA showed that while Soldiers' NFC scores did not differ from students or police officers ($F(2, 97) = .893$, $p > .05$), their self-reported maximization scores did ($F(2, 97) = 5.626$, $p = .005$). Specifically, Bonferroni post hoc tests revealed that both Soldiers ($M = 125.97$, $SD = 17.14$, $p = .045$) and police officers ($M = 121.40$, $SD = 17.14$) scored significantly lower on maximization than students ($M = 136.52$, $SD = 17.41$, $p = .006$). Given that in the overall analysis above self-reported maximization was significantly associated with SP and DD, a series of MLMs were run that factored in maximization and type of participant (Soldier, police officer or student) with SP. This MLM showed a significant interaction between the type of participant and maximization ($p < .05$). Hence a series of independent MLM models were run within each participant type. Here, MLM found that the effect of maximization on SP was non-significant for Soldiers ($\beta = -.005$, $p > .05$), but it was significant for police officers ($\beta = -.022$, $p = .001$) and students ($\beta = -.006$, $p < .0001$). While both coefficients were negative (meaning that overall increases in maximization caused decreases in SP) the coefficient for the effect of maximization within the police sample was larger than within the student sample, meaning the relationship was more pronounced within this sample. What this means, therefore, is that maximization has a more detrimental effect on decision-making for police officers than students, and that it affects both police officers and students more than it affects Soldiers.

H_2: Soldiers will outperform members of the emergency services in all least-worst situations because of an improved decision-making style

This study also provided support for H_2. Looking at the overall performance of the three samples, the Soldier sample was, on average faster in the SAT, CT, DT and ComT than the police officers and student sample. Furthermore, they reported higher SP and lower DD. The overall comparison of the three groups across SAT, CT, DT and ComT is shown in Figure 7. Overall Soldiers had stronger strengths of preference ($M = 3.92$, $SD = 1.23$) than both police officers ($M = 3.13$, $SD = 1.45$) and students ($M = 3.59$, $SD = 1.49$) and reported that the decisions were easier ($M = 40.80$, $SD = 21.04$) for them than the police

officers (*M* = 41.60, *SD* = 21.87). The students reported that the decisions were, overall, much harder (*M* = 48.35, *SD* = 21.48). There were no other significant differences.

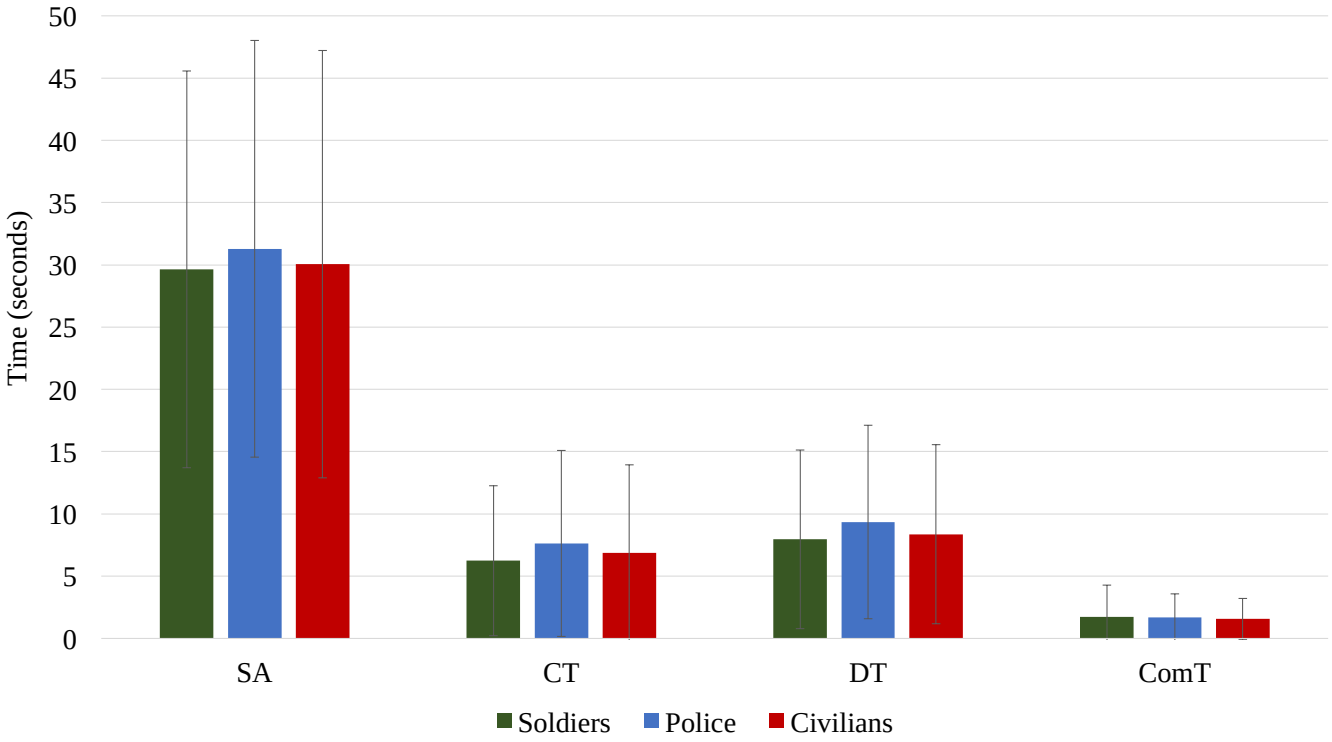

Figure 7: Soldier, police officers and student performance across 32 decision points.

MLM with the participant as a random effect and type of participant as a fixed effect found that, overall, there was a significant effect of participant type on CT, in that police officers were slower to decide (β = 1.37, *p* = .078) than Soldiers. In addition to this, when looking at ComT, students were significantly faster to commit to a choice than Soldiers (β = -.398, *p* = .036). However, student participants' strength of preference was significantly less than the Soldiers (β = -.772, *p* < .0001) and police officers (β = -.580, *p* = .003), and the increase in reported decision difficulty was significant when factoring in the hierarchical nature of the data. Specifically, overall a student respondent was likely to have a 7-point increase in decision difficulty for each scenario when compared to a Soldier (β = 7.79, *p* = .006) and a 6-point increase when compared to a police officer (β = 6.88, *p* = .036). Hence, it is clear then that there are unique differences between each of the three

samples in their decision-making throughout this study and that, overall, Soldiers did outperform their police officer and student counterparts in this decision-making study.

H_3: Members of the emergency services and Soldiers will all be more resistant to inertia when making military decisions vs., making least-worst decisions in a non-military setting.

Scenario Type: Our study also shows support for H_3. Overall, a series of one-sample t-tests showed that there was a wealth of differences in SAT, CT, DT, SP and DD when comparing performance, across the sample, on military and non-military scenarios. The overall performance and mean differences between the scenario types are shown in Table 13. Overall then, participants were slower to develop SAT in military scenarios ($t(3110) = -2.796$, $p = .005$). However, they were faster to make a choice ($t(3182) = 2.295$, $p = .005$) and to submit that choice ($t(3178) = 3.162$, $p = .002$) when making a military decision. They were not faster to commit to a choice ($t(3190.42) = 1.733$, $p = .083$). Participants also had weaker preferences for choices when they were facing military scenarios ($t(2793.65) = 7.96$, $p < .0001$). They also reported military scenarios to be more difficult ($t(3000.32) = -17.841$, $p < .0001$).

	Non-Military scenarios (n = 1749)	**Military Scenarios (n = 1363)**	**Mean Difference**
SAT (seconds)	29.44 (SD = 17.02)	31.10 (SD = 16.81)	*-1.66***
CT (seconds)	7.11 (SD = 6.89)	6.39 (SD = 6.67)	*0.72***
DT (seconds)	8.73 (SD = 7.43)	7.91 (SD = 7.19)	*0.82***
ComT (seconds)	1.62 (SD = 2.15)	1.50 (SD = 1.71)	0.12
SP	3.76 (SD = 1.39)	3.34 (SD = 1.58)	*0. 42****
DD	38.11 (SD = 20.92)	51.18 (SD = 19.79)	*-13.07****

* = $p < .05$ ** = $p < .001$ *** = $p < .0001$

Table 13: Performance on military and non-military scenarios.

MLM controlling for the random effect of the participant confirmed several of these findings showing that SAT was significantly slower for military scenarios (β = 1.7, p = .003). Both CT and DT were significantly faster in military scenarios (β = -.69, p = .002 and β = -.80, p = .001 respectively). MLM found that ComT was approaching significance, with participants being faster to commit to a choice when facing military scenarios (β = -.13, p = .065). Strength of preference was significantly lower for military scenarios (β = -.43, $p < .0001$) and military scenarios were viewed as harder, with, overall, there being a 13-point difference in decision difficulty for military scenarios (β = 13.21, $p < .0001$). So, overall, when people were making military decisions they took longer to assess the situation but were faster to make choices, even though they found them more difficult and were less sure about their choice.

Scenario Type Controlling for Participant Type: MLM found that when controlling for the effect of participant type there was still a significant effect of scenario type on SA (β = 1.70, p = .003), CT (β = -.09, p = .002), and DT (β = -.80, p < .001). Once again, the effect of scenario type on ComT was approaching significant when factoring in participant type (β = -.12, p < .065). When factoring in participant type, the effect of scenario type on SP was also significant (β = -.45, p < .0001), as was the effect of scenario type on DD (β = 13.20, p < .0001).

Scenario Type x Participant Type: Furthermore, there was also an interaction effect between scenario type and participant type on SAT, CT, DT, SP and DD (p < .05). Given this, a series of two-level MLM were run within each participant type to explore the unique relationships between scenario type and decision-making. Within these comparisons, several interesting findings emerged. Firstly, military scenarios only resulted in increased SAT times within the police (β = 2.44, p = .0042) and student groups (β = 2.06, p = .033). There was no effect of scenario type within the military sample. Furthermore, while both students (β = -.076, p = .042) and Soldiers (β = -.76, p = .013) were faster to make a choice in military scenarios, this effect was much more pronounced in the military sample (β = -.76 vs., β = -.076), and non-existent in the police sample, whose CT was no different between military and non-military scenarios. Similarly, police participants showed no difference in overall DT between military or non-military scenarios whereas both Soldiers and students were faster in military scenarios (β = -.78, p = .0138, β = -.92, p = .013 respectively). When looking at SP, while all groups showed an overall weaker SP for military scenarios the effect was much more pronounced in the police (β = -.82, p < .0001) and student participants (β = -.50, p < .0001) than in military participants for whom the difference was only approaching significance (β = -.12, p > .056). When looking at decision difficulty, again, while military scenarios were universally viewed as harder, this was much more pronounced with police officers (β = 19.52, p < .0001) and military participants (β = 13.62, p < .0001) than student participants (β = 8.78, p < .0001). To put this in perspective, military scenarios were rated as almost 20 points (on a 100-point scale) harder by police participants, and 13 points harder by Soldiers, yet on average they were only viewed as 8 points harder by students.

Performance within each scenario type: Finally, and just as a point of perspective, I investigated the performance of the three participant types within the military and non-military scenarios alone. Here, MLM found that when facing military scenarios there was no difference between the groups in terms of their SA, DT, ComT, or DD. However, police participants were slower that military to choose a course of action (CT; $\beta = -.58$, $p = .010$). Students were also less confident in their choice but did not differ significantly from Soldiers in terms of decision-making speeds (SP; $\beta = -.99$, $p < .0001$). When looking specifically at non-military scenarios students were slower than Soldiers ($\beta = -.44$, $p = .026$) and police officers (*ns* but $\beta = -.44$, $p = .056$) to commit to the choice after it was made (ComT), less confident in their choices than Soldiers ($\beta = 0.606$, $p < .0001$) and police officers ($\beta = -.72$, $p < .0001$) and reported decisions as harder than Soldiers ($\beta = 9.94$, $p < .001$) and police officers ($\beta = 11.61$, $p = .001$). Hence, there are more differences between the samples within non-military scenarios than military scenarios.

Overall findings for scenario type: Overall then there are a host of domain-general and domain-specific findings when looking at how military and non-military personnel make military and non-military decisions. People were slower to get SA during military scenarios, but faster to choose and commit to a course of action. This is especially interesting given that they were, on average, less committed to a given course of action (lower strength of preference) and often found the decision harder. However, scenario types did affect each group equally, most notably while military scenarios were viewed harder by Soldiers, this did not slow down their decision-making. Police participants, on the other hand, were slower to make military decisions. Furthermore, students seemed particularly slow to make decisions in the non-military scenarios. They were also less sure of their choices. Which is even more interesting when we consider that the students found the military scenarios the least challenging of the three. So, while military scenarios did change decision-making patterns overall, each participant type was uniquely affected by them.

H_4: Because Soldiers show less inertia, they must have more engrained value systems than those who become inert (namely members of the emergency services).

Overall, I provide support for H_4. When looking at differences within value systems, a one-way ANOVA showed that there are significantly different value strengths between the three types of participant ($F(2, 97) = 4.891$, $p = .009$), with Soldiers having an overall stronger value system ($M = 15.39$, $SD = 4.49$) that police officers ($M = 12.19$, $SD = 5.61$, $p < .05$). When looking at individual values, there were significant differences in scores for the value "protecting life" ($F(2, 97) = 3.742$, $p = .027$), "protecting Soldiers" ($F(2, 97) = 7.123$, $p = .001$), "completing the mission" ($F(2, 97) = 3.617$, $p = .031$), "pursuing the enemy" ($F(2, 97) = 2.952$, $p = .057$), "avoid negative consequences" ($F(2, 97) = 4.362$, $p = .015$), "everyone's right to free will" ($F(2, 97) = 4.369$, $p = .015$), "exerting authority" ($F(2, 97) = 3.742$, $p = .027$), and the "need to obey orders" ($F(2, 97) = 3.742$, $p = .027$). Bonferroni post hoc showed that police officers valued protecting life significantly less than Soldiers ($p < .05$) and students (*ns*, $p < .082$). Police officers valued protecting the lives of Soldiers less than Soldiers ($p < .05$) and students ($p < .05$). Soldiers valued completing the mission and pursuing the enemy significantly more than police officers ($p < .05$). Finally, police officers valued the right to free will significantly less than students ($p < .05$) and the need to exert authority less than Soldiers ($p < .05$). The differences between the three groups across all 11 values are shown in Figure 8.

To investigate the unique effect of value system within each of the three groups, a series of interaction effects were modelled using two-level MLMs. There was a significant interaction between the strength of values and type of participant on decision difficulty ($p < .05$) and strength of preference ($p < .0001$). Given this, a series of MLMs were run independently within each participant type. This found that, with regards to decision difficulty, value systems significantly affected ratings of DD in the student sample ($\beta = -.027$, $p < .0001$), but not in the police officer or, Soldier sample. When looking at the relationship between strength of value system and SP within each group, MLM found that value systems had no effect on the student or military sample ($p > .05$), but it did have an effect within the police sample ($\beta = -.054$, $p = .039$). What this means then is that students with strong value systems show a general lower preference for options while police officers

with high value systems show a higher decision difficulty. Irrespective of value system strength, Soldiers showed a stronger strength of preference and lower decision difficulty.

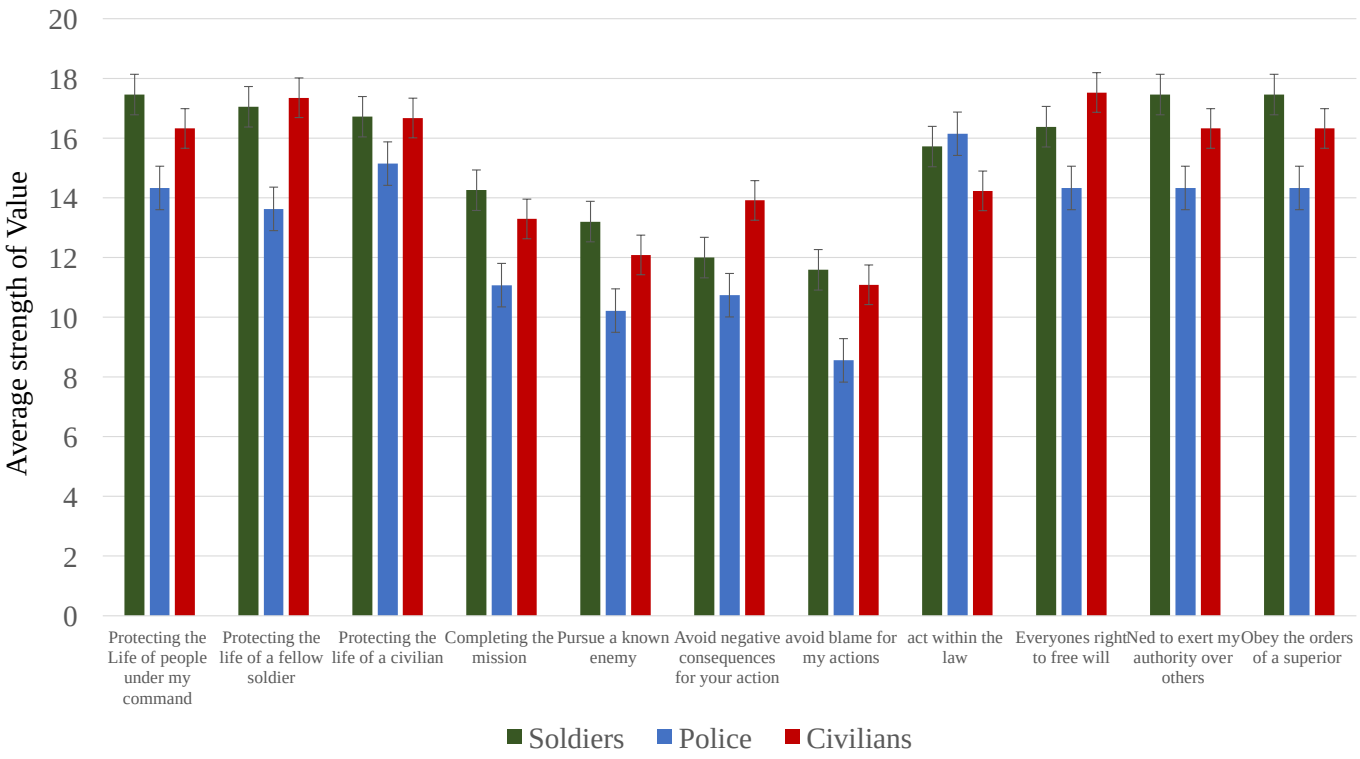

Figure 8: Mean differences on value scores across 10 values.

Value Systems

In the last two chapters, I have attempted to classify values as "sacred" and "secular" based on their relative importance to the decision-maker. Based on the findings of the last chapter, and to an extent, the perceived subjectivity of identifying the values at play within a given scenario, here I try an objective method of analyzing values.

In this chapter, instead of tradeoff types, I sought to investigate value systems; that is, I wanted to analyze patterns of values that exist and how these patterns of values may be linked to differences in decision-making. To achieve this a Principal Component Analysis (PCA) was run to sort individuals' scores on the 11 SVMs into meaningful components. PCA was selected here because I am operating *a priori*, that is, without any

theoretical guidance on what patterns of values should emerge. Overall, the ideal number of participants is at least 5 times the number of items (O'Rourke, Psych & Hatcher, 2013, p. 9). Here I have 11 items and 100 participants, making it appropriate to run a PCA. Analysis of the correlation matrix of the 11 items identified perfect collinearity between two of the factors (a cause of singular correlation matrices); "protect life" and "obey orders". Given this, these two items were removed from the analysis to allow calculation of Kaiser-Meyer-Olkin and Bartlett's test of sphericity (critical to ensure PCA is a suitable analysis method for this data). Once removed, the scale the Kaiser-Meyer-Olkin measure of sampling adequacy was .84, well above the recommended value of .6, and within the boundaries of "meritorious" (one level below "marvelous" see by Kaiser, 1974a, 1974b). Bartlett's test of sphericity was also highly significant ($\chi 2$ (36) = 393.201, $p < .0001$). Hence, I can be sure that a PCA is a suitable analysis method.

An initial factor analysis identified two factors with eigenvalues >1. These two factors combined to explain 61.73% of the variance (49.63% and 12.15%) respectively. This, coupled with an analysis of the initial scree plot indicated that two-factor solution was optimal. When this PCA was run with an oblique rotation method (using Oblimin rotation) all variables heavily loaded onto a single factor. Given this, a Varimax rotation was used because it redistributes the variance more evenly among the factors, producing less complex factors and easier results to interpret (Kass & Tinsley 1979, p. 134). The outputs of this PCA are highlighted in Table 14 using the guidelines provided by Comrey and Lee (1992; in which >.71 is *excellent;* .63-.70 is *very good;* .55-.62 is *good;* .45-.54 is *fair;* < .44 is *poor*).

Value	Factor 1	Factor 2
Protect Life	***0.866***	0.131
Protect Soldiers	***0.878***	0.173
Protect Civilians	0.75	0.424
Complete Mission	0.264	***0.716***
Pursue Enemy	0.265	***0.701***
Avoid Negative Consequences	***0.479***	***0.517***
Avoid Blame	0.031	***0.737***
Act Within the Law	0.269	***0.659***
Free Will	***0.537***	***0.521***

Note: ***Bold italicized*** values are those that exceed .45

Table 14: Value loadings on a two-factor PCA with Varimax rotation.

Taking only those variables which dominantly loaded onto a single factor ("avoiding negative consequences" and "everyone's right to free will" loaded equally among the two whereas "protecting civilians" did not load sufficiently onto either) and adding a semantic interpretation to the factors, and the values loaded on them there are two "clusters" that appear; Egocentric and Empathetic values. Egocentric values (Factor 2) are those that center around the self; "completing the mission", "pursuing an enemy", "avoiding blame", and "acting within the law". Empathetic values (Factor 1) on the other hand are those centered around others; "protecting the lives of Soldiers" and "protecting the lives of people under your command".

To explore the between-group effects of value systems on decision-making each participant was assigned a dominant value system based on their score across the six variables (Empathetic: Protecting life, Protecting Soldiers, Egocentric Values; Complete mission, pursue enemy, avoid blame, act within the law). Because there are twice as many egocentric values as empathetic values, the overall score for each value system was divided by the number of values within it (so, 4 for egocentric, and 2 for empathetic). This method is adapted from current methods of assigning dominant "types" when constructing "typologies" of criminal behavior which often involve uneven variable distributions (see,

for example, Salfati & Canter, 2000). Using this method, all participants could be assigned to either an "Empathetic" (68%) or "Egocentric" value system (32%). While the distribution of value systems was not even within the three participant groups (see Figure 9), Pearson's chi-squared showed that this difference was not significant (χ^2=3.882, p = .141). Looking at overall scores as continuous variables (rather than assigning a binary "type"), overall there was a significant difference on Empathetic value scores between participant types (F(2, 97) = 6.013, p = .013) and Bonferroni post hoc revealed that Soldiers (M = 17.25, SD = 5.47; p = .006) and students (M = 17.19, SD = 3.46; p = .008) both scored significantly higher than police (M = 12.89, SD = 7.08) on their Empathetic value score. There was no significant difference between scores on the egocentric value system (F(2, 97) = 2.213, p = .115). This is shown in Figure 9.

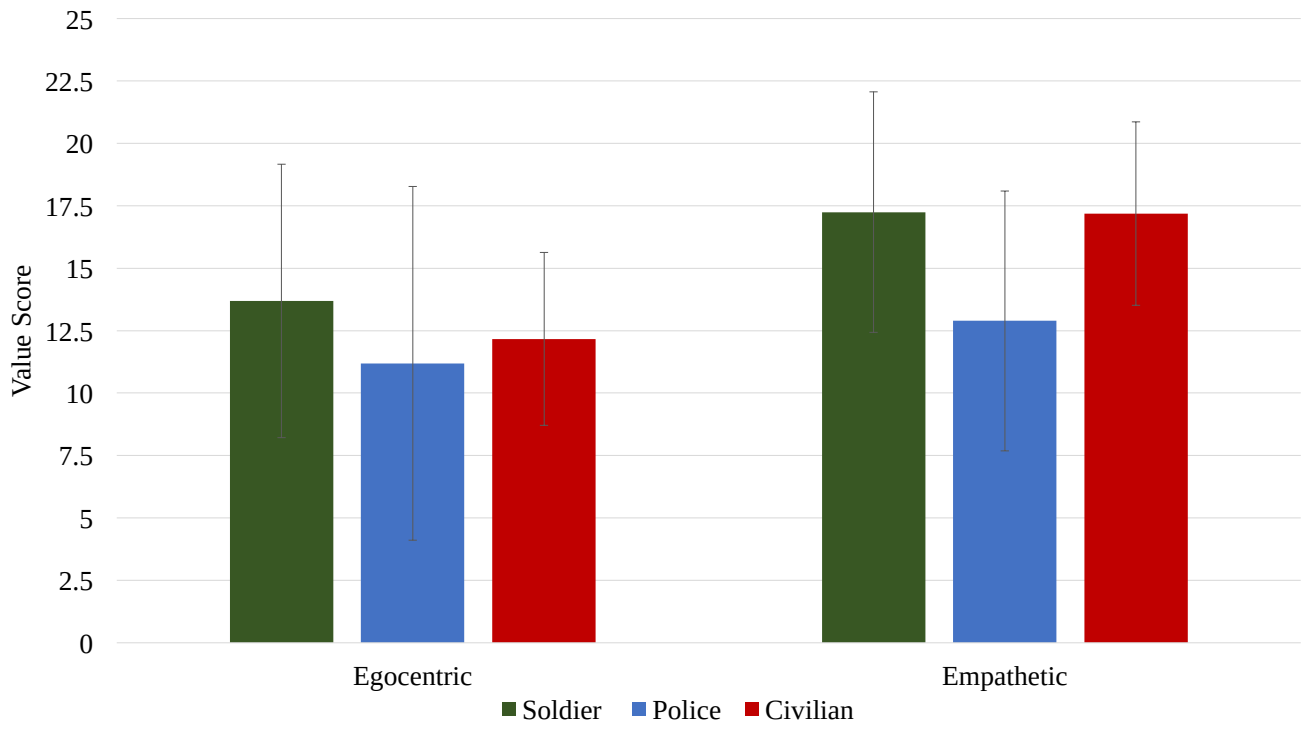

Figure 9: Empathetic and Egocentric value systems across participant types

Discussion

In this chapter, I sought to test four assertions that I have made throughout this thesis (each one stemming from my qualitative analysis). I wanted to investigate: how, if at all, Soldiers had different personalities than police and student counterparts; if Soldiers were better decision-makers that police and student counterparts; if overall, everyone was a better decision-maker when facing a military situation; and finally, how differences in values between groups might affect decision-making. Overall, I found degrees of support for all four of my hypotheses. Now, the relationships between the many variables here are not simple, and there are a series of within and between group differences and interactions which require explaining, but I can, with the data analyzed above, advance the following findings;

1. Soldiers do make decisions faster than police officers
2. Soldiers do have subtle personality differences which impact their ability to make decisions
3. People make faster decisions when in a military scenario
4. Soldiers do have distinctly different value systems from police officers

We will elaborate on each of these findings (and their complexities) below.

Finding 1: Soldiers do make decisions faster than police officers

In relation to decision-making speed, my findings show an interesting commonality between Soldiers and students in that both are, generally, faster at decision-making than their police counterparts. Overall Soldiers were faster to choose a course of action, commit to it and showed a stronger preference and lower decision difficulty for their choice. What is most interesting about this finding is that it is domain-general meaning that overall, across both military and non-military scenarios, Soldiers were faster decision-makers and it is not the effect of a domain-specific series of military scenarios. This provides evidence for my hypotheses that there is a baseline difference in the willingness to make least-worst

choices and to commit to courses of actions. In attempting to explain why this is true however there are two possible explanations; the person, or the situation. I explore both below.

Finding 2: Personality differences and decision-making

It is well known that people differ in the way they make decisions and that these differences are, to varying degrees, related to a series of individual differences in personality, cognitive and decision-making styles (Dewberry, Juanchich & Narendran, 2013). Here, I focused on three common factors that have been used to predict individual differences in decision-making ability; experience (Klein, 1993), need for closure (Kruglanski et al., 1998) and self-reported maximization (Turner et al., 2012). While in this study each of these factors was related to individual differences in decision-making, they present a complex pattern of association. Looking at experience first; experience is most often linked to improved decision-making in that it increases the "library" of analogies with which one can draw upon (Klein et al., 1998) and generally aids their situational awareness (Endsley, 2000). Hence, it should have resulted in improved decision-making. Here, however, I found the opposite effect, in that those with more experience were slower to make a choice and reported experiencing more difficulty within the scenario. One explanation for this is that, as outlined in one of Klein's earliest studies, experience aids our ability "to identify and carry out a course of action without having to generate analyses of options" (Klein, 1997, p. 285). Perhaps here then the issue is that I was presenting the courses of action to the decision-maker, removing one of the fundamental benefits of experience. The increased difficulty may, therefore, reflect difficulty because of the inability to identify their own courses of action, rather than the difficulty of making the decision between them.

The findings for NFC may have a similar explanation. Overall, NFC is associated with being able to cognitively close on a solution, rather than searching all available opportunities and trying to "maximize". Time and time again it is linked to fast decision-making with low uncertainty (e.g., McKay, Langdon & Coltheart, 2006). Here, however, high NFC was associated with slower decision-making in that those with high NFC scores

had weaker preferences for an option and found decisions harder. One potential interpretation of this is that, despite finding the decisions harder, the decision-making of high NFC participants was not slower than who scored low-NFC - despite the strong correlation between DD and overall decision-making speed. This implies then, that while high NFC decision-makers were not more decisive in this study (and again, as above, the effect of NFC may not emerge within a paradigm that offers no "searching" or "plan development" phase), there is evidence at least that, in the face of hard decisions, their decision-making is not slowed. This would provide some support for the overall utility of NFC in that despite finding choices harder and being less confident, they were not any slower to commit to them.

Maximization, on the other hand, did act as intended in that those who were higher in self-reported maximization found the decisions harder and showed a lower preference for their choice. This finding is expected given that overall maximization is associated with postponing a choice in favor of finding an alternate (and better) choice. Here, however, participants were provided with two choices, neither of which were ideal. However, again it is interesting that maximization did not predict decision-making speed, simply perceived difficulty and strength of preference. What is also interesting is the finding that maximization is domain-specific affecting police and student participants, but not affecting Soldiers. Lest not forget that both Soldiers and police scored significantly lower on maximization than students. This means that not only are Soldiers less likely to have a need to maximize, there is also some evidence that despite a trait level desire to "maximize" a situation, Soldiers were better able to "switch off" this need and focus on action. Hence, the analysis does show that overall Soldiers differ from non-Soldiers both in the overall need to maximize situations, as well as how much this tendency affects their decision-making.

Finding 3: People make faster decisions when in a military scenario

One hypothesis I advanced was that people are, generally, more prone to action when making military decisions. What this would mean is that there is nothing "special" or "unique" about the Soldiers themselves but that, in general, people are more decisive

when they are making military decisions. Now, while I have already shown that, Soldiers do have distinct personality factors, a series of interesting findings emerged when police officers and students made military decisions. Here, and very much in line with social psychological perspectives of priming and the impact of "the situation" (e.g., Coleman, 2004; Zimbardo, 1969), while the SAT was slower for military scenarios, all other decision variables were lower (CT, DT, ComT). Contra-logically then, SP was lower and DD was higher. This meant that, on average, despite finding scenarios harder participants were faster to choose a course of action, showed less commitment delay and were faster to submit it. Hence, there is something about a military scenario which makes people less inert. The fact that this was confirmed by MLM (during which correlational associations frequently became non-significant) reinforces the strength of this effect. What is also apparent is that this effect was group-specific, meaning that while the difference was very pronounced in the Soldier and student sample, most these findings were not significant for the police sample meaning that their performance did not benefit from this military "bump" in decision-making speed. This finding, therefore, does support that the simple fact that a least-worst decision was presented "in war" gave people a sense of urgency which spurred decision-making (despite the scenarios being viewed as more difficulty). This finding then supports the wider field of social psychology in that when people are placed in stereotypical roles in which any type of action or response is expected of them, they often find themselves acting up to that. What is also especially interesting is that the scenarios were presented in a random order meaning that this military "prime" was operating directly within each scenario and not leaking into their performance in the non-military scenarios.

Finding 4: Soldiers do have distinctly different value systems from police officers

One of the most important points of focus throughout this thesis has been the role that values play in preventing inertia, and while in Chapter 7 I did not find support for the effect of tradeoff type, here I have strong evidence that value systems are an important factor in decision-making. Looking at the overall performance, Soldiers showed an increased ability to commit to a course of action in both military and non-military

decisions. Soldiers also scored significantly higher, on average, across all 11 values on the SVM. Hence it is viable to propose that they have a stronger value system guiding their decisions. Furthermore, this increase in value strength was not specifically isolated to the "Soldier-centric" values of "protecting Soldiers" or "completing the mission," but they generally outscored their police counterparts on all 11 values. So too did the students (except for one; "acting within the law"). When looking back at Tetlock's (2003) work on values and tradeoffs, perhaps what this stronger value system creates is a more poignant awareness of the importance of values. In Tetlock's work (although not confirmed by us in Chapter 6) when a sacred value is at play, decisions are faster and easier to make. Perhaps here, by having stronger values overall, these values are more poignant, making it easier to identify those that are sacred, and hence, choose the option that does not tradeoff against it.

In addition, the Soldiers' value system is not only stronger, but stronger in relation to a specific subset of values. Hence, not only do Soldiers have quantifiably stronger values they have qualitatively different value systems. To further explore this relationship a PCA was used to investigate "clusters" or groups of values which might reflect an underlying "system" or "construct." A PCA was used to prevent the role of subjectivity which might have been seen with other clustering methods such as a smallest space analysis (see Salfati & Canter, 1999). This PCA identified two main factors which I interpreted as "Empathetic" and "Egocentric" that is, one factor seemed to be related to those values which focused on helping others, while the other focused on values associated with the self and avoiding blame. When Soldiers scores on these two constructs were compared to police and students, Soldiers scored significantly higher on the values associated with empathy ("protecting the life of those under my command" and "protecting Soldiers"). Empathy is the emotion of being concerned with the welfare of others. Empathy facilitates interpersonal relationships and influences people to engage in prosocial and altruistic behaviors (Mencl & May, 2009). Empathy comprises of two components cognitive and affective (Hoffman, 1987); Cognitive empathy involves thinking about those potentially suffering, and taking their perspective, i.e., thinking about another person's situation. Affective empathy, on the other hand, involves feeling compassion and sympathy (Batson, 1990). Empathy has often been linked to decision-making (specifically moral decision-making; Pizarro, 2000), with the

view that being able to experience empathy should encourage others to think about others first and not themselves.

This view of empathy (putting others before ourselves) is clearly tied with decision inertia and least-worst decisions. Although perhaps the link has not yet been made. In 2012, as outlined and referenced several times in this thesis, Claudia van den Heuvel and colleagues published the results from a simulated terrorist attack in which counter terrorism officers oversaw making several critical decisions surrounding when, if at all, to cancel the parade. Here, the authors reported that accountability and "save self" priorities "'derailed' officers from making "save life" decisions. Instead, albeit in a minority of cases, they either made errors of omission by failing to make any decision at all or inappropriate choice deferrals (by insisting another agency made the decision or that the decision could be made later)." (p. 165). Hence here, thinking about the self, and not other people, created a focus on anticipatory regret and a lack of action. Recent work by Power and Alison (2017) with critical incident responders also highlight how, too often, officers get pre-occupied thinking about what will happen to them if they do, or do not, act, rather than prioritizing actions that could help save other people. Hence, when looking at value systems and the ability of Soldiers to "tolerate" bad outcomes, the role of their value systems might be both domain general and domain specific in that when facing a least-worst outcome they effectively prioritize empathetic values that are ingrained in them.

What I am saying here then, is not that a lack of empathy or "thinking about others" causes inertia; this is clear from the papers mentioned above. What the findings here suggest however is a potential reason as to why Soldiers are not as susceptible to this is that their value system is so heavily focused on saving others. Re-visiting Figure 9, I clearly cannot say that Soldiers "do not think about themselves" (they scored higher on these variable than the police), but the degree of difference between their scores on these egocentric variables and the variables surrounding protecting life are larger than their police counterparts, it is perhaps this critical difference between the self and others, between Soldier and police officers, that may hold the key to understanding the difference in their propensity to become inert.

Conclusion

Since Chapter 4 I have known that there is something different about Soldiers. Despite using the same prompt many other researchers have used, and asking them to recall the exact type of situation that creates decision inertia, they appeared resilient. In this chapter, I sought to identify what it was about them that made them "unique" and more tolerant to least-worst outcomes. I identified many things; firstly, they are different. They have less of a tendency to maximize and the need for maximization doesn't seem to affect them the same way it does police officers and students. Secondly, military environments seem to impose on people a "temporary" resilience to inertia and results in a domain general increase in decision-making. Finally, I identified that Soldiers have stronger values. Specifically, when looking at their value system they placed more importance on empathetic values. This, I argue helps them not get stuck in the redundant deliberation that occurs in critical incidents in which someone becomes preoccupied with anticipatory regret and the potential blame that may bestow them if a negative outcome occurs.

CHAPTER 9: THERE AND BACK AGAIN: VALUES, INERTIA AND MILITARY DECISION-MAKING.

I am glad you are here with me. Here at the end of all things

- Frodo Baggins (in J.R.R. Tolkien, The Return of the King)

The etiology of this thesis lies within a single paper. In fact, it stems from a single figure within that paper. Figure 10 shows the original publication of the SAFE-T model as outlined by van den Heuvel, Alison and Crego (2012). When this paper was published, I was working as a social scientist with the Defense Science and Technology Laboratory (DSTL) working on issues of military performance, a large part of which was centered on decision-making (e.g., Klein, 1993). However, what struck me most about this article, and the SAFE-T model in general, was its incredible relevance for military decision-making. At a time when perspectives were either entirely recognitional (e.g., RPD) or multiattribute (doctrinal and rational), the SAFE-T model offered a knowledge gathering framework to not only unpack the decision-making process, but to model the effects of the many pressures that exist within the military decision-making environment. Furthermore, given that a central aspect of the SAFE-T model is identifying how, when and why decision-making becomes derailed, it provided a theoretical warrant with which we could explore the manifestation of decision inertia within military decision-making.

It was with this thought that this thesis started; the theoretical and practical utility of the SAFE-T model as a framework to consider military decision-making. However, this thesis evolved from this idea. While I did identify the role of many factors listed in the SAFE-T model (accountability, exogenous and endogenous uncertainty), what I did not find was the same level of inertia within military decision-makers. Hence, while I still feel that the SAFE-T model is a relevant and useful theory, what it does not do is explain why military decision-makers demonstrated an increased ability (at least in comparison to studies of police decision-making in least-worst situations; e.g., Alison et al., 2006; Power & Alison, 2017) to commit to a course of action when the likely consequences are negative. Given this, I sought to provide a theoretical framework that may explain the process of, and individual differences in, committing to least-worst choices. Based on the findings from the qualitative analysis I centered on the role of values. Here, and moving away from

the naturalistic perspectives I emphasized in the early chapters of this research, I started to examine the role of values in the lab. Furthermore, I compared values both within military personnel and between military and non-military personnel to provide empirical support to the qualitative observation about the *improved* ability of Soldiers to make these types of least-worst choice.

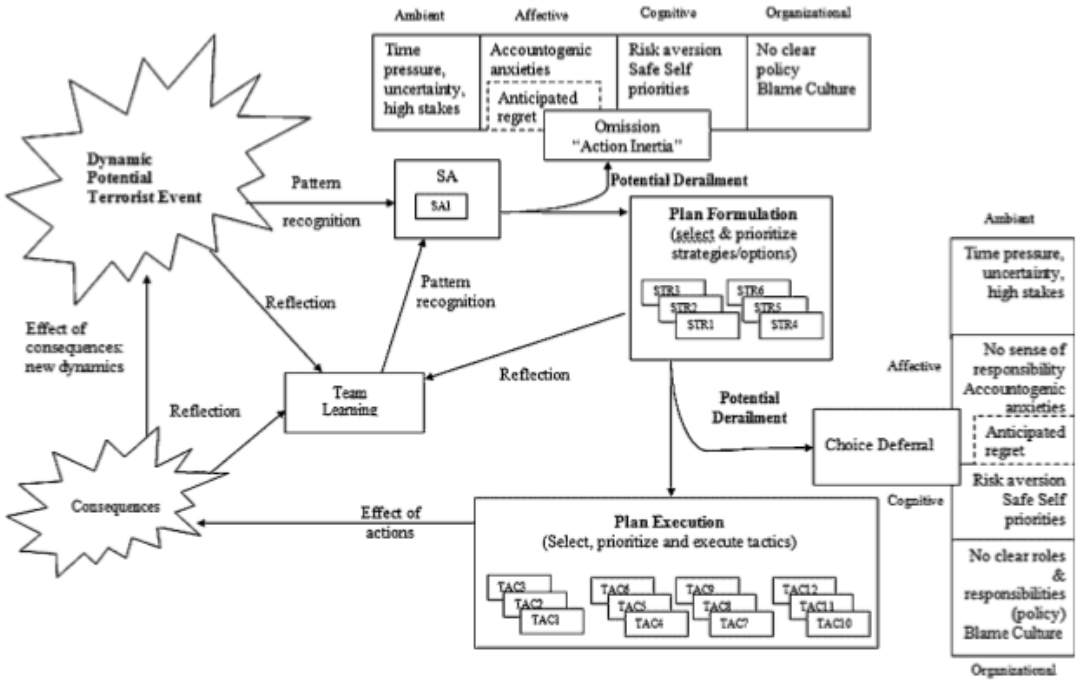

Figure 10: The SAFE-T model (recreated, with permission, from van den Heuvel, Alison & Crego, 2012).

Despite the evolution of this thesis away from simply "testing" the relevance of the SAFE-T model, what this thesis has always centered on is the need to expand our perspective of military decision-making and to better conceptualize and study the ecological niche within which these decisions are made. In this chapter then I reflect on this aspect. I begin by looking back at the history of thinking surrounding military decision-making, and how I have contributed to that. In addition, I talk about my work on values and what this adds to our understanding of military decision-making. In addition, I go wider

still and discuss the contributions of this work to the wider field of decision-making. In addition to this I highlight some of the important future directions that this research can take as well as some of the methodological flaws that should be addressed going forward. Finally, I reflect on decision-making overall, and what this work can add to our understanding of how least-worst decisions are made, or not made.

How Military Decisions are Made

When reflecting on the contribution of this research to our understanding of how military decisions are made, it is perhaps prudent to re-visit Gary Klein's (1989) original article on the subject in which, he argued, the military needed to move away from analytical decision-making. In his words (p. 56);

> *"It is time to admit that the theories and ideals of decision-making we have held over the past 25 years are inadequate and misleading, having produced unused decision aids, ineffective decision training programs and inappropriate doctrine… The strategies sound good, but in practice they are often disappointing. They do not work under time pressure because they take too long. Even when there is enough time, they require much work and lack flexibility for handling rapidly changing field conditions… The point for this article is that there are different ways to make decisions, analytical ways and recognitional ways, and that must understand the strengths and limits of both in order to improve military decision-making."*

Klein observed platoon leaders and battle commanders (at a series of training events) and found that "85 percent of the decisions were made in less than 1 minute" (p. 58). From his estimations, "experienced decision-makers handle approximately 50 to 80 percent of decisions using recognitional strategies without any effort to contrast two or more options. If we include all decision points, routine plus non-routine the portion of RPDs goes much higher, more than 90 percent" (p. 59). It is clear then that most decisions being made were multiattribute and did not involve the comparison of multiple courses of action (as is

outlined in military doctrine). In fact, as Klein reports when he told Soldiers he was studying decision-making, some of whom replied that they had "never made any decisions!" As Klein notes "what he meant was that he never constructed two or more options and then struggled to choose the best one" (p.58). The reader may see the parallels here with some of my own conversations with Soldiers in which they felt like they had never made a decision (see page 95 of this thesis). Now, before we move forward to the present day, it is important that we outline some of the finer points of Klein's argument; specially as they pertain to the importance of multiattribute decision-making. Despite the over-representation of RPD decisions in the military (as high as 90 percent), Klein still maintained the importance of considering both strategies. As he states, "the point… is that there are different ways to make decisions, analytical ways and recognitional ways, and that we must understand the strengths and limitations of both to improve military decision-making" (p. 57). Hence, in Gary Klein's view, while there was an absolute need for there to be a refocusing of training and doctrine to emphasize recognitional methods, this was not do be done *in lieu* of multiattribute methods. There simply needed to be a balance between the two as both have strengths and weaknesses.

From here then there has been a significant push towards developing this recognitional ability (sometimes referred to as "intuition" see, for example, Peterson & Seligman, 2004). As Mike Matthews outlines in his "vision" for training intuition in Soldiers in 2030 in which "to use Klein's naturalistic decision-making terms, our fictional recruit is building a sophisticated and detailed inventory of experiences-as real as those he will later build through real world missions- that will allow him to (bloodlessly, as General Scales would say) response quickly, accurately, and effectively when his boots hit the ground in some faraway land." (p. 67). The importance of Klein's work in developing such intuition is clear. The issue however, as is often the case with scientific findings, is that over time the nuances of this paper have become lost (for another example of this diluting of theoretical theory over time see Gill & Corner, 2017) and perhaps the scales have swung too far away from multiattribute decision-making. Well, not multiattribute decision-making *per se* (which we outline the issues of in Chapter 2), at least the idea that people make decisions *at all*. While this may not be far from the truth (as Klein 2011 notes, "we contrast options in perhaps 5-10 percent of cases" p. 87), it is our presupposition that

denigrating the process of choice entirely is theoretically damaging for our understanding of military decision-making, as well as problematic if we are not training Soldiers to make effective choices when the time comes (even if it is only 5% of the time). This is especially true if (as my interviews support), those 5% of choices are what Taleb (2008) would call "black swans" in that they are rare, unpredictable, high-risk, and very high consequence. If so, then it is when decision-makers most need to make decisions, that their intuition is often not enough.

The first contribution of this thesis is to re-emphasize the importance of choice within a military context. Now, at first this might sound like a calling card to bring back multiattribute decision-making; it is not. While we maintain that members of the military do make choices, these choices are not those that can be explained with multiattribute theory (for the many reasons outlined in Chapter 2 and 3). Instead we posit that members of the military make least-worst choices, and these choices do require a process of option evaluation and eventually "choosing" a "better" choice. However, from a theoretical standpoint, what this thesis contributed is the importance of considering the ecological niche within which such decisions are made. While multiattribute perspectives view decisions as the outcome of a comparison of the merits of the available options, the data here provides a far richer and far more complex picture (like naturalistic decision-making in general). Here our data highlights the importance of exogenous and endogenous uncertainty, trust, anticipatory regret, role confusion. Hence, and as stated earlier in this chapter, this thesis strongly supports the relevance of the SAFE-T model as a knowledge generating platform for military decision-making as it pertains to the detrimental effect of these many external and internal pressures on the process of decision-making. Psychological research has extensively tested the presumptions of RPD (e.g., experience and situational awareness) in military decision-making (e.g., Baber, Fulthorpe & Houghton, 2010; Millitello, Sushereba, Branlat, Bean & Finomore, 2015). Others have focused on the role of uncertainty and time pressure on military decision-making (Ahituv, Igbaria & Sella, 1998) but many of the factors within the SAFE-T model remain unexplored. For example, no research (besides the qualitative data presented here) has examined the role of inter or within-team trust, accountability or anticipatory regret on military decision-making. Our data supports that these are important factors and further

work needs to experimentally manipulate such factors (either lab-based, or naturalistically within ISLEs) to measure their impact. Such research will have important implications not only for understanding decision-making, but also informing organizational policies such as the degree of accountability we place on Soldiers during war.

Good Decision-*Makers* vs., Good Decision-*Making*

The second contribution of this thesis is to elucidate the individual differences that exist both within Soldiers and between Soldiers and other individuals who make critical least-worst decisions. Let us first look at what makes a *good* military decision-maker. As stated in Chapter 7, "predicting" who will make good decisions under conditions of uncertainty, high-stakes and time pressure is a central concern for military selection. Here we found several factors that were associated with an increased ability to commit to least-worst courses of action. The issue, however, is that despite the importance of this, most of the "factors" we look at are closely tied to RPD (experience) and hence are "developed" rather than "innate." As stated prior, the "cognitive" factors highlighted in the Oxford Handbook of Military Psychology include intuition and insight and are centered on heuristics, biases and discussions of "thinking fast" vs., "thinking slow" (see Kahneman, 2003). Here, we took a far more cognitive approach, focusing on measurable individual differences that are shown to predict wider decision-making. The first factor we focused on was NFC; an epistemic motivation for a firm answer and an aversion to ambiguity (Kruglanski & Webster, 1996; Webster & Kruglanski, 1994). They also are more likely to "jump to conclusions" (McKay, Langdon & Coltheart, 2006). People with high NFC process less information before committing to a choice and generally generate fewer hypotheses to account for the data (Kruglanski & Mayseless, 1987). Overall then, those in NFC should be better decision-makers in least-worst situations, because of a willingness to generate a choice and commit to it rather than tolerating the uncertainty of option comparison. Here, however, we did not find this. In neither Chapter 7, or 8 did we find evidence that NFC was linked to decision-making performance in any way. Those high in NFC and those low in NFC, within both police, Soldier and civilian populations made decisions at the same speed. Instead, the effect of NFC was more prominent in the reported

decision difficulty and the strength of preference shown. However, rather than showing an easier experience, or more commitment to a choice, those high in NFC showed weaker preferences and reported lower preferences to their choices overall.

There are several potential reasons for this contra-logical finding regarding NFC. First and foremost, there are a series of on-going discussions about the validity of on-going NFC measures, and specifically the fact that it should be treated as multifactorial (rather than a single unified factor; see Kruglanski et al., 1997). In fact, the full version of the NFC scale included five independent facets: 'desire for predictability' (8 items), 'need for order' (10 items), 'discomfort with ambiguity' (9 items), 'decisiveness' (7 items), and 'closed-mindedness' (8 items). The issue however, is that studies have found that these five facets are not all positively related. For example, Shiloh, Koren and Zakay (2001) found that certain facets of the NFC scale were associated with perceived decision difficulty, while others were not. This, they argued "indicate that the association between individual differences in need for closure and decision representations is complex, and support the position that this construct too should be treated as multi-dimensional" (p. 707). In fact, in their study several of the sub-scores had opposite influences on perceived decision difficulty, in that two subscales contributed negatively to decision difficulty ('decisiveness' and 'closed-mindedness'), while three others ('preference for order', 'discomfort with ambiguity', and 'preference for predictability') were all positively associated with decision difficulty. Shiloh et al.'s findings may therefore, potentially, shed light on our own. Here we used the 15-item shortened version of the NFC scale developed by Roets and Van Hiel (2011). Roets and Van Hiel developed this shortened version by extracting the three highest loading factors from each of the five facets and while there 15-item version shows strong correlation with the full 42 item version (.95), the model itself only explained 23.10% of the variance. What this mean here is that our measure is perhaps NFC "light" in that while it correlates, overall, with NFC it does not allow for the full expansion and analysis of these unique subsets and the multifactorial nature of NFC. It is viable therefore that our relationship between NFC and decision difficulty is driven by certain subsets within the NFC scale. Hence, before we make any strong claims about the reverse-effect of NFC within military decision-making, it is important that this research is repeated with the full

42 item scale so that we can effectively isolate the unique influence of each of the five facets within this multifactorial construct.

The second factor we examined was self-reported maximization. Building on Simon's (1955, 1956) work in this area Schwartz et al. (2002) developed the "self-reported maximizers scale" to measure individual tendencies in efforts to maximize rather than satisfice. Previous research shows that people who report a strong desire to "maximize" a situation (i.e., find the ideal outcome) have worse life outcomes (Bruine de Bruin et al., 2007). Here, I found that maximization did predict individual differences in decision-making. Specifically, those who scored higher in maximization found the decisions harder to make and, overall, reported a lower strength of preference for a choice. Hence, maximization conformed the expected findings; that when they were not able to maximize a situation (i.e., because the two choices were presented to them) individuals found the decisions harder to make. It is important to state that maximization (nor NFC) was associated with any behavioral differences (i.e., slower decision-making) but overall, both those who scored highly in both factors found the decisions harder, and showed a lower preference for their choices.

Finally, we looked at experience. NDM research has often highlighted that experts are decision-makers than novices because they generate experience-based hypotheses (Klein, 1997; Lipshitz, Klein, Oransanu, & Salas, 2001). Under time pressure specifically, experts outperform novices because they make more efficient decisions because of their larger reserve of hypotheses stored in long-term memory (Stokes & Raby, 1989). Specifically, Pascual and Henderson (1997) found that experts were better at prioritizing decision tasks and Patel et al. (2014) found that experienced medics were better at detecting errors. Here then, we assumed our experienced decision-makers would outperform novices. Interestingly however, the opposite occurred. When we looked both within the Soldier sample, and between the Soldier and police sample we found that as experience increased so too did decision time and decision difficulty. So, experienced decision-makers found the choices harder and took more time to make them; the opposite of our hypotheses. However, there are several important factors that should be considered when we draw inferences from these findings. Firstly, in their research with police decision-makers, Alison, Doran, Long, Power and Humphrey (2013) found no effect of experience on

hypothesis generation and how decision-makers handled time pressure. Now our findings our not suggesting that more experienced decision-makers are "worse" at decision-making. Like Alison et al., (2013) what our dependent variables lack is a metric of "quality". Instead we simply showed that they found the choices harder and were slower to make decisions. When examining why this may be there is a strong methodological component which should be considered. The effect of experience within NDM is rooted within their "library" of experiences which aids situational awareness (Endsley, 2000), option generation, and visualization (Lipshitz et al., 2001). None of which were required in this study. Specifically, decision-makers were provided with situational awareness within a "closed" scenario, and the options were provided to them. Hence there was no tasks within which experience usually distinguishes experts from novices. This, it is arguable, may have mitigated the positive effect of experience which is so-often seen in wider naturalistic research (see Alison & Crego, 2008). Hence, when you remove the process of situational awareness and hypothesis generation from the decision-making process, it is viable that we did not generate a platform from which experts could distinguish cognitively themselves from novices. When looking then at why they were in fact slower (and did not perform the same), Klein (1989) found that more experienced decision-makers took longer in the situational awareness phase of decision-making (to use a military parlance from our interviews; novices are more likely to "rush to failure"). So, there is precedent. Hence, what we may be seeing here is more "poise" in our expert decision-makers, whose experience is not helping them generate options, but is instead providing them more context to understand the implications of their decisions and the many variables at play.

Least-Worst Decision-Making and Decision Inertia

As stated at the start of this chapter, a principal premise of this thesis was to explore the psychological manifestation of decision inertia as it pertains to the military decision-making process. However, our early interviews showed an incredible resistance to inertia within the Soldiers we interviewed (or at least their recollection gave no indication of inertia). Experimentally I was then able to demonstrate that, when faced with a least-worst option, Soldiers did show an increased ability to commit to a choice. As with any scientific

enquiry, our goal then became to identify *why*? What is it about those who enter the Armed Forces that enables them to commit to choices when it counts. Now, there are several possible explanations. One is personality; many of the Soldiers we interviewed expressed they had a "decisive personality." For example, one of our interviewees recalled;

> *I'm a pretty confident guy and I think military officers in general are pretty "Type A" and I think that you know you don't get to where you're at unless you're successful and have some amount of confidence. So, I was 90% sure that...going up there with the QRF [Quick Reaction Force] was the right choice and I was 110% sure that getting the hell out of there was the right choice.*

In support of this view, there is evidence (found here and elsewhere) that those who enter the military *are* different. Jackson and colleagues (2012) used a longitudinal sample of German males who either did, or did not enter the military and found that those who did enter the military were lower in agreeableness, neuroticism and openness to experience during high school. In a similar vein, Klee and Renner (2016) found in a sample of 236 Soldiers that they were higher in emotional stability and lower in openness and agreeableness than civilians. In addition, Jackson and colleagues found that military training itself lowered levels of agreeableness (meaning that people who enter the military are different from those who do not, and are changed further by the process of military training). While here we do not have longitudinal data to determine which factors are a cause, or effect, or entering the military, we did find that our Soldier sample had lower levels of the need to maximize than their student counterparts. However, in terms of personality there were few differences between our Soldiers and the police sample; meaning that while it is possible that these personality differences separate those who choose high-risk occupations (police, fire, military) and those who do not, they perhaps do not separate those who excel at making critical decisions within such occupations.

In addition to focusing on the personality/decision-making style predictors, this thesis sought to identify additional theoretical explanations for this phenomenon. Based on our analysis of the interviews we conducted we developed an emerging theory about the

importance of values and while our specific theory about value tradeoff types did not receive empirical support when tested (potentially this stemmed, at least in part, from a range of methodological issues; see Chapter 7), Chapter 8 showed the importance of value systems; Soldiers were faster decision-makers and had stronger value systems than their police and student counterparts. Furthermore, we found that Soldiers scored significantly higher on the values that associated with the "empathy" subset of the 11 values we tested. With this data, we could confirm our fourth hypothesis "*Soldiers show less inertia, they must have more engrained value systems than those who become inert (namely members of the emergency services).*" However, to fully explain the role of values we need to draw upon both sets of data; the quantitative data we have on Soldiers' value systems and decision-making, and the qualitative data we collected and analyzed in Chapter 4 and 5.

The "Subtle Art of Not Giving a F*ck"

As the final chapters of this Ph.D. are being written there is a current best-seller on the *New York Times* list holds a surprising overlap with the underlying ethos of this thesis (despite its less-than scientific phraseology). Mark Manson (2016) released a book titled "The Subtle Art of Not Giving a F*ck"[7] within which he provides a modern commentary on issues surrounding happiness and self-worth. In the opening sections of this book is a sentiment that, to me, sums up my reflections the hundreds of hours of interviews conducted with Soldiers and, crucially, why they are better at accepting least-worst options;

> The desire for more positive experience is itself a negative experience. And, paradoxically, the acceptance of one's negative experience is itself a positive experience. (p. 7).

To rephrase Monson; the quest for a positive outcome creates a negative outcome, while the acceptance of a negative outcome creates a positive outcome. This is what the

[7] While I apologize for the vulgarity of the language this is, unfortunately, the language of choice of the author. It does not reflect the views of this author, nor does it imply, in any way, that Soldiers "do not give a F*ck." As we shall see, this is not the case; nor the argument of Monson (2016).

Philosopher Alan Watts referred to as a "Backwards Law" referring to the fact that the quest for one thing can create the opposite outcome (in effect it is the opposite of a self-fulfilling prophesy; in that the belief that something is the case creates that eventuality). Putting this in perspective it provides a nice frame of reference for our emerging understanding of military decision-making. What the Soldiers in this study seemed able to do was to accept a negative outcome and act. On the other hand, and from a detailed analysis of Power's (2016) work, and L. Alison's wider work in this area; it is the efforts of others to make a positive out of a potentially negative situation that creates a negative.

Now, let us dig deeper, because it is important that we emphasize that what differentiates Soldiers is not the fact that they "do not give a f*ck" (this could not be further from the truth). In Monson's work, he outlines several subtleties to "not giving a f*ck" because, as he outlines "there is a name for a person who finds no emotion in anything: a psychopath. [and] why would you want to emulate a psychopath?" (p. 13). Firstly, "not giving a f*ck" does not mean being indifferent (i.e., caring about nothing). Secondly, and this is critical, "not giving a f*ck" about adversity means caring about something more important than adversity. Let us put these two subtleties together with our data. From a qualitative standpoint, Soldiers demonstrated a willingness and ability to tolerate the adversity of a bad outcome to make a critical least-worst decision because they cared about something *more* than this adversity. That is, they held values that trumped any adversity they would experience because of their decision. In the Police sample, it is viable to propose from the work of Power (2016), that perhaps they were unable to decide because they did not care about anything *enough* to tolerate the adversity of a bad choice. To back this up with our data, Soldiers scored significantly higher than police officers on empathetic values, from this we can perhaps extrapolate that there is a significant differentiation to them between adversity (negative consequences, blame) and other values (saving soldiers, and others). Now, while here we have applied our data to a "popular psychology" model of values and decision-making, the underlying ethos is the same; Soldiers seem to value the welfare of others over negative consequences to themselves. It is clear, that to begin to apply this finding, significant future research is required to better understand this relationship (and specifically look within scenarios when egocentric and empathetic values

are clashing) but it offers significant promise to support the role of values as a central factor in individual differences.

Widening the lens of "option comparison"

In the first chapters of this thesis I outlined the history of decision-making and how the field has moved from the rational-comparison of options through to a pattern-matching model. What the SAFE-T model added to this was the importance of the environment in decision-making and how factors present within the decision-making environment can derail decision making. However, what the latter chapters of this thesis have added to this picture is that there is, perhaps, an additional aspect that needs to be considered when attempting to understand the way in which critical least-worst decisions are made; intrinsic value systems. We are not saying that value systems are the only "intrinsic" factor; but here we have extensively focused on the role that they play. The importance of considering such systems is that only factors within the individual have the potential to explain individual differences in least-worst decision-making and specifically why some individuals find certain decisions hard, while others do not. Looking at the SAFE-T Model for example, levels of uncertainty may be the same, accountability may be the same, as will anticipatory regret; yet some individuals will still find it easier to decide than others. Hence there is an additional variable (or set of variables) that are influencing the decision-making process. Here, we looked to values as an explanatory variable in that whether a decision is hard, or not, is the interaction of the options available (multiattribute), the decision-making environment (SAFE-T), and the internal evaluation of the consequences of each value (e.g., Tetlock). Hence, what we have sought to add here is the importance of not simply looking at what makes critical-incident and military decisions hard, but what makes a specific decision hard for that specific individual, and easy for another. In this sense, we have sought to expand the role of the individual and what they bring to a decision (outside of experience).

Methodological Considerations

Throughout this thesis, we have highlighted many methodological considerations that should be factored into our analysis. Briefly; we identified the issues of post hoc bolstering in our interviews, the issues of "forcing" choice within our SBT and the potential issues with using STATA (rather than SPSS) for the statistical analysis. There is, perhaps, one methodological issue that warrants an over-arching commentary and that is the coupling of "inertia" and "slower" decisions. Specifically, our metric of "inertia" in Chapters 6, 7 and 8 was "slower" decisions. However, it is essential that we re-emphasize that delays (in the region of a few seconds) is not necessarily "inertia" especially if several of the decisions are not time-critical (e.g., the decision to send a student home does not have to be made that second). In these instances, it is important that further SBT (or even live-exercise research) "opens up" the experimental design to provide an opportunity for true inertia to emerge (i.e., not taking time critical action). Given this then, when looking at our results, it may be prudent to view that while several factors (NFC, maximization, experience, and values) do affect decision-making, whether (and how) these directly affect inertia needs to be explored in a more open environment. Despite this, at the very least, this thesis has identified several factors which, to date, have never been explored in relation to military decision-making. This research should therefore be viewed as a warrant to widen the scope with which we look at military decision-making. In addition, and without making reference to inertia, this research showed quantifiable differences in the performance of Soldiers and police officers in our study. These differences need to be explored because (as identified in Chapter 3), if we can isolate the reasons for which Soldiers do outperform police officers we can begin to use such knowledge to support training and decisions surrounding recruitment and leadership.

In addition, we can extend this limitation to add some warrant to our comparison of military and non-military decisions because it is viable to propose that, because of the nature of military operations, these vested in the individual a need to act that was above and beyond that of the non-military scenarios. While some of the non-military scenarios absolutely required immediate action (e.g., saving a child from a tunnel), others did not (e.g., sending a student home from a study abroad program). Given this, future research

might need to be more specific to flesh out any unique effect of military situations by presenting equally time-urgent military and non-military scenarios.

Finally, and in terms of future research, it is essential that longitudinal research is employed. In line with Jackson et al., (2002), such research would play an important role in isolating what it is about being "in the military" that manifests in these between sample-differences. Such work would also benefit from being able to follow individuals within the military, allowing the identification of relationships between least-worst decision making outcomes such as promotion and performance. In this sense, least-worst decision making (or more simply wider NFC and maximization) should be operationalized the same way that on-going research uses "grit" as a predictor of performance and longevity (see Laurence & Matthews, 2012).

Overall Conclusions

This thesis started with the simple presupposition that neither doctrinal methods nor RPD sufficiently explained how decisions were made in the field. With a dearth of research outside of these perspectives to draw on, I looked to the psychological literature on how people make decisions in critical incidents and the parallels that apply between these two contexts. From here, we sought to expand the theoretical frame with which we view military decision making to factor in a series of exogenous and endogenous factors that present within the military decision-making environment and (anecdotally) affect decision making. We also specifically focused on decision inertia as an outcome of making decisions when these factors are present. By sitting with Soldiers who had made critical least-worst decisions and conducting CDM interviews we were able to confirm that, as predicted, within the critical incident literature, many of these factors are present within military decision-making and they do affect the decision-makers' calculus. That said, inertia was far less prevalent than predicted. Given this, we sought to understand, from a theoretical perspective, the way in which Soldiers made least-worst decisions. By doing so, perhaps we could isolate what prevented them from suffering from inertia. Our theoretical exploration brought me to the importance of values and the role that values play as a moderator in the process of comparing options; namely, when an option involves a

sacred value, it is immediately prioritized above the other (unless the second option also involves a sacred value). From here we framed the process of least-worst decision making as a process of value tradeoffs and developed a series of testable hypotheses. By developing an immersive SBT that measured values and forced participants to choose between two least-worst options, I then set about testing these hypotheses both within a Soldier sample, and between Soldiers, police officers and students. These experiments both confirmed and rejected our expectations; reinforcing the importance of values and considering individual differences in several psychometric scores, but questioning our simple value tradeoff model.

Overall, reflecting on the interviews I conducted and drawing on the data I collected, the value systems of Soldiers is a central component of least-worst decision making. They demonstrated (qualitatively) an improved ability to prioritize values within least-worst choices, and (quantitatively) an increased importance on empathetic values that focused on others. These findings are merely preliminary, and of course our understanding is limited by the experimental paradigm we developed, but this thesis presents a strong case for future research to integrate what is known elsewhere about value systems and decision-making (Hanselmann & Tanner, 2008; Tanner et al., 2007), and how Soldiers make critical least-worst decisions in conditions of incredible psychological and physiological pressure.

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Appendix A: Recruitment Advertisement

[To be sent via email from the University of Massachusetts Lowell Veteran Services].

Have you ever experience indecision when operating as a member of the United States Armed Forces?

If so, you can help us understand how and why indecision occurs during military operations.

We are looking for individuals who have served as members of the United States Armed Forces (Army, Navy, Marine Corps, Air Force, Coast Guard, as well as reservists) to participate in a research study conducted here at the University of Massachusetts Lowell. Specifically we are looking to understand the situations within which decision-makers can spend too much time considering the options available too them, potentially leading to inaction. This is a phenomenon known as "decision inertia" which can often occur in high-stakes, complex environments where an individual must choose between two or more options and where both of those options are difficult.

What will you have to do?
Participants will be asked to discuss one event from their time operating on deployment when they had to choose between one or more options and spent a lot of time thinking about all the possible outcomes. **This interview will be conducted here at Umass Lowell** and will take 1-2 hours. **The information provided in the interviews will remain anonymous**

How will you participation help the United States Armed Forces?
The results of your interview, and interviews we conduct with other members of the United States Armed Forces will be used to develop training aides aimed at reducing Soldier indecision. These will be integrated into future training to help training for future members of the Armed Forces.

What do I do if I am interested in participating?
If you would like to be involved in this study, and/or would like any more information on the research, what it entails and how we aim to use it to support future training of the United Stated Armed Forces, please email Neil_shortland@uml.edu, or call at 978-934-4045.

We look forward to hearing from you!

Appendix B: Participant Information Sheet

UNIVERSITY OF LIVERPOOL

PARTICIPANT INFORMATION FORM

Study Title: Decision-making on Deployment: The presence of decision inertia during least-worst decisions

Name of Researcher: Neil Shortland (neil_shortland@uml.edu), Prof. John Horgan (John_horgan@uml.edu) and Professor Laurence Alison (l.j.alison@liverpool.ac.uk)

Research Institutions: This research is funded by the Umass Lowell Office of the Vice Provost for Research and will support a Doctoral thesis overseen by the University of Liverpool.

You are being invited to take part in a research project aimed at investigating how decisions are made in adverse conditions. It will involve an interview in which you will be asked to discuss a situation whereby you had to make a decision in which all outcomes were potentially negative. Here is some information to help you decide whether or not to take part. Please take time to read the following information carefully and discuss it with friends and the researcher if you wish. Ask if there is anything you do not understand or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

1. There is likely no direct benefit to you from taking part in the study. However, information obtained during the course of the study may help us to increase our understanding of how difficult and complex decisions are made in adverse environments.

2. Your participation is completely voluntary and if you choose to participate you are free to withdraw at any time and without giving a reason. There is a slight risk that asking you to recall events during your deployment may cause you stress or discomfort, therefore, you are free to skip any question or questions you do not want to answer and can stop the interview at any time without any negative consequences to you or to your educational standing or any services you may receive at UMass Lowell.

3. The interview will take approximately 2 hours to complete and with your permission we would like to audio-record the conversation to ensure that data analysis is as accurate as possible. If you do not want to be audio-recorded hand written notes will be taken. This study will involve you discussing (at an unclassified level) a situation you encountered, when on deployed service, in which you had to choose between two or more options, where both of those options were difficult. With your permission, your responses will be audio recorded, your interview will transcribed by the researcher and made anonymous. **The**

audio file will then be deleted. The information you provide will be completely confidential. No personal data about you will be disclosed to anyone outside of the research team.

4. The collective results of this interview, and the others conducted will be made available to all participants via Neil Shortland (neil_shortland@uml.edu). All audio recordings will be deleted prior to the end of this project (July 2015).

5. Complaints should be addressed to the UMass Lowell IRB at irb@uml.edu or call 978-934-3452. Information provided should include the study name or description (so that it can be identified), the principal investigator or student investigator or researcher, and the substance of the complaint.

WHO CAN TAKE PART IN THE STUDY?

You are only eligible to take part in the study if you have been a member of the United States Armed Forces (Army, Navy, Marine Corps, Air Force) and have been on at least one deployment.

If you have any questions about this study or your eligibility for it then please do not hesitate to ask the lead researcher, Mr. Neil Shortland (email: neil_shortland@uml.edu Tel: 8144044948)

This project is being supervised by Professor John Horgan (john_Horgan@uml.edu) and Professor Laurence Alison (L.J.Alison@liv.ac.uk)

The University of Massachusetts Lowell Counseling Service can be contacted at:

Email: counseling@uml.edu

Phone: 978-934-4331

The University of Massachusetts Lowell Veteran Services can be contacted at:

Email: veterans@uml.edu

Phone: 978-934-3031

Appendix C: Informed Consent Form

UNIVERSITY OF LIVERPOOL

PARTICIPANT CONSENT FORM

Study Title: Decision-making on Deployment: The presence of decision inertia during least-worst decisions
Name of Researcher: Neil Shortland (neil_shortland@uml.edu), Prof. John Horgan (John_horgan@uml.edu) and Professor Laurence Alison (l.j.alison@liverpool.ac.uk)

Please tick boxes	**Yes**	**No**
1. I confirm that I am 18 years of age or older and have read and understood the information sheet for the above study.	☐	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time.	☐	☐
3. I understand that none of my personal details will be recorded and that all responses will be made anonymous prior to analysis and publication of any data.	☐	☐
4. I understand that I will be asked to discuss a situation that occurred as part of my role as a member of the United States Armed Forces and it may cause me stress or discomfort.	☐	☐
5. I understand that to take part in the study I must be currently (or have been in the past) a member of the United States Armed Forces and that I have been on deployed duty at least once.	☐	☐
6. I understand that data supplied by me can be removed at my request at any time after my participation by contacting neil_shortland@uml.edu.	☐	☐
7. I understand that this discussion must be at the **unclassified level** and I must not provide any information that is classified or sensitive.	☐	☐
8. I agree to take part in the study.	☐	☐
9. I agree to be audio-recorded for the interview.	☐	☐

This form is to be read before the interview. At the start of the interview you will be asked to verbally confirm that you agree to all of the statements above.

Appendix D: Gatekeeper contact script

Email and Phone/Face-to-Face Script for Gatekeepers

Email Script

Dear [Gatekeeper name]

I am requesting your help to support recruitment efforts for an on-going research project titled ” Decision-making on Deployment: The presence of decision inertia during least-worst decisions”. This research is funded by the Umass Lowell Office of the Vice Provost for Research and is conducted in partnership with researchers from the University of Liverpool.

Specifically we are looking for individuals who have served, or are currently serving as members of the United States Armed Forces (Army, Navy, Marine Corps, Air Force, Coast Guard, as well as reservists) to speak about their experiences of making decisions during military operations.

To support recruitment for this study we are hoping to share our call for participants with current or former members of the Armed Forces in the Boston area. To achieve this we would be very grateful if you could forward the call for participants (attached as a pdf to this email) to any veteran or active service members that you are aware of. If an individual is interested in participating the call for participants asks that they contact us so that we can provide them with more information regarding the study, the requirements for participants and answer any questions they may have about the research.

We would like to emphasizethat the information provide by participants will be completely confidential. No personal data will be disclosed to anyone outside of the research team.

If you would like any more information about this study or what it entails please not hesitate to contact us.

Many thanks and best wishes,

Neil Shortland

Senior Research Associate
Center for Terrorism & Security Studies
University of Massachusetts Lowell
School of Criminology & Justice Studies
113 Wilder street, Rm 433.
Lowell, MA 01854-3060
Email: neil_shortland@uml.edu

Phone: 978-934-4045

Phone/Face-to-Face Script

Dear [Gatekeeper name], many thanks for speaking with me.

I am requesting your help to support recruitment efforts for an on-going research project titled ” Decision-making on Deployment: The presence of decision inertia during least-worst decisions”. This research is funded by the Umass Lowell Office of the Vice Provost for Research and is conducted in partnership with researchers from the University of Liverpool.

Specifically we are looking for individuals who have served, or are currently serving as members of the United States Armed Forces (Army, Navy, Marine Corps, Air Force, Coast Guard, as well as reservists) to speak about their experiences of making decisions during military operations.

To support recruitment for this study we are hoping to share our call for participants with current or former members of the Armed Forces in the Boston area. To achieve this we would be very grateful if you could forward the call for participants (that will be emailed to you, with your permission, after this phone call) to any veteran or active service members that you are aware of. If an individual is interested in participating the call for participants asks that they contact us so that we can provide them with more information regarding the study, the requirements for participants and answer any questions they may have about the research.

I would like to emphasizethat the information provide by participants will be completely confidential. No personal data will be disclosed to anyone outside of the research team.

At this time I would like to ask if you have any questions regarding the research, our sample pool, the procedure or data protection? (answer yes/no: if yes – provide answers and further detail).

Based on what you have heard above, are you happy to help with our recruitment efforts by forwarding our call for participants? (if so this will be provided to them via email after the conclusion of the phone call).

Many thanks and best wishes,

Neil

Appendix E: Semi-Structured Interview Script

1. PREAMBLE

To build rapport and to occur while offering the participant coffee/tea/water

Prompts:

- Tell me a little about your background?
- How long have you been at Umass Lowell?
- What is your major? Why did you decide on that major?
- What do you plan to do when you finish the interview?

2. INTRODUCTIONS AND INFORMATION ON STUDY/INTERVIEW

- Ensure that everything on the information sheet was understood
- Ask if they have any further questions, or would like any point elaborated
- ***Collect (pre-signed) participant consent form***
- Provide informal context – my background, origins in the UK Ministry Of Defense, experience of working as a embedded scientist and how these experiences formed the basis of my research and this study.
- Based on the context given above provide informal outline of the research, how long the interview will take, what it will involve and how it will be used.

3. VERBAL BRIEFING

"Thank you for coming. This interview will last no more than 2 hours, and is entirely voluntary and you can withdraw at any time. This interview is in support of a research project sponsored by the UML Dean's Office for Research, and will form the basis of my PhD thesis on military decision-making. My hope is that this research will help inform how difficult and complex decisions are made in adverse environments. In particular, I am interested in a concept called decision inertia. We already know that where individuals must choose between two or more options and where both of those options are difficult there is often a tendency to spend too much time considering each option and this can lead to inaction. By way of example, an by reference to a non-military scenario consider the option of inoculating a child against a respiratory illness where there is a reasonable chance that the vaccination will result in a heart condition. However, a failure to inoculate could lead to the respiratory illness and death. What makes these decisions especially difficult is that both options are potentially bad, in both cases it is difficult to predict what will happen if you inoculate or not and it is a situation in which there are significant risks. So, I am going to be asking you in a moment to spend some time thinking about a decision that you had to make, as a Soldier, and in which you had to choose between one or more options and in which you spent a lot of time thinking about all the possible outcomes. Commonly, this requires you to spend a fair bit of time thinking about a suitable decision, so please do not feel rushed."

4. PRE-SWEEP 1

- Check that the above sentence is clear, and ask if they have any questions based on what was stated above, offer further examples of least-worst decisions (planned in advance).
- Remind participant that they can still withdraw their data both now, and after the fact. If they decide that they are actually unhappy – I can erase the tape at any time after the interview.
- Reassure them that any names, dates, locations etc., will be made anonymous when I am transcribing, and none of it will be reported in any research papers.

5. SWEEP 1: INCIDENT SELECTION

Sweep 1 Prompt:

- Based on what we've discussed above, could I now ask you to think of a suitable situation that you have faced. Please, take your time… there is no rush.

Sweep 1 Outcome:

- Participant offers (and/or describes in full) a situation that they have faced in which they felt they had to make a least-worst decision AND they felt experienced decision inertia.

Outcome Response:

- Provide positive reinforcement, express interest in this case, and reinforce its utility here.
- Ask to be taken through this scenario in as much detail as possible
- If sweep 1 lasted a significant amount of time (e.g. <30 minutes) offer a short break/welfare check.

6. SWEEP 2: CONSTRUCTING A TIMELINE

Sweep 2 Prompt:

- What we have found in the past to be very helpful is to ask interviewee's to construct a time line. This helps flesh out the key decision points, the key events, and the key people.
- Present the participants with a selection of sample time lines (see Crandall et al., p. 74).
- Discuss example, highlight that they have mapped out key events, people and decisions – emphasises that the specific timing is not important (in minutes, hours, even days) – we are mainly looking to identify the order of events.
- Present participants with a white board, and pens.
- Emphasizethat the goal of this is to help unpick the situation
- Encourage them, if they are comfortable doing so, to talk the interviewer through the timeline as they are generating it.
- Reinforce that they can take their time and draw a timeline in a way that makes sense to them – **there is no format** - mistakes can easily be erased (provide them with board eraser).

- The interviewer is not to interrupt this process. All comments/questions (unless prompted by the participant) must remain until the participant has finished constructing their timeline -

Sweep 2 Outcome:

- Participant presents a timeline of the key situation.

Outcome Response:

- Provide positive reinforcement, express interest in this case, and reinforce its utility here.
- Follow up with any gaps/areas that you do not fully understand/would value elaboration upon.
- If sweep 2 lasted a significant amount of time (e.g. <30 minutes) offer a short break/welfare check.

7. SWEEP 3: DEEPENING

Sweep 3 Script:

"So, we are now going to go into a fair bit of detail around the particular issues I am especially interested. As I said at the very beginning one of the key issues that I am looking at and exploring is this concept of how people choose between difficult options. I obviously don't want to put words into your mouth and I have got a sense already, of course what the key decisions and options were, but just to be sure that you and I are on the same page, please could you clarity what the key decisions were, and what the options were that you found difficult to choose between."

- Repeat your interpretation of the event back to them – highlighting what you perceived them to perceive as the key decisions and options available to them.

Sweep 3 Prompt:

- Acknowledge that they have now gone through the event twice, in extensive detail but state that the goal of the following questions are to help us understand what they were thinking at each of the key decisions/events in their timeline.
- Show them the aide memoire that you have on the desk – state that this is to help you both discuss the event from a series of perspectives, including their goals and priorities, their options, and assessments.

Aide Memoir Prompts:

Cues:	What were you hearing/thinking/noticing during this situation?
Information	What information did you use in making a decision or judgment?
	How and where did you get this information, and from whom?
	What did you do with this information?
	Did you discard any information that you received?
Analogs	Did this situation remind you of any previous experiences you have had?
	What were the parallels you drew between the situation and others?
Standard Operating Procedures	Did this case fit a standard scenario?
	Is this the type of event you were trained to deal with?

Goals and Priorities	What were your specific goals and objectives at this time? What was the most important thing for you to accomplish at this point?
Options	What other courses of action were considered? What courses of action were not considered, and why? Was there a rule that you were following in choosing this option?
Experience	What specific training or experience was necessary or helpful in making this decision?
Assessment	If you were asked to describe the situation to someone else at that point, how would you describe it?
Mental models	Did you imagine the possible consequences of this/these action(s)? Did you create some sort of picture in your head? Did you imagine the events and how they would unfold? How close was your imagined outcome to the actual outcome?
Decision-making	What let you know that this was the right thing to do at this point in the incident? How much time pressure was involved in making this decision? Did you think about it for too long? Were you ever worried about the time it was taking to make the decision? How long did it take to actually make this decision?
Guidance	Did you seek any guidance at this (or any) point in the decision? How did you know to trust the guidance you got?
Feelings	How did making this decision-make you feel? How did you feel about potentially making the wrong choice?

Sweep 3 Outcome:

- Participant provides an in-depth insight into the process of their decision-making within this given case.

Outcome Response:

- Provide positive reinforcement, express interest in this case, and reinforce its utility here.
- If sweep 3 lasted a significant amount of time (e.g. <30 minutes) offer a short break/welfare check.

8. SWEEP 4 'WHAT IFS':

Sweep 4 Prompt:

- There is one final phase; it will not take longer than 15 minutes. There are only four questions.
- The goal of this section is to look back in hindsight, and evaluate possible hypothetical scenarios

Sweep 4 Aide Memoire:

Expert-novice-contrasts	If a novice had been in charge at this particular point in the incident, what type of error might they have made, and why? If you had encountered this decision earlier/ later in your tour (or in another subsequent/earlier tour) what would you have done differently?
Hypotheticals	If (key feature) of the situation had been different, what impact would that have had on your decision/assessment/actions/feelings?
Experience	What training might have offered you an advantage in this situation?
Aids	What knowledge, information, or tools' technologies could have helped?

Sweep 4 Outcome:

- Participant provides hindsight and hypothetical views on the situation

Sweep 4 Outcome Response

- Inform them that there are no more questions, and thank them for going through the situation in such detail with you.
- Ask if they have any questions for you, or if there is anything they would like to say/add that they have not said above.

9. REINTEGRATION/DEBRIEF

Reintegration Prompts (will ideally follow on from conversations started in the 'PREAMBLE', but viable cues include):

- Discuss future day/week plans
- Discuss upcoming events/exams/deadlines that they may have as part of their role as a student at UML
- Discuss how they are enjoying this semester and the classes they have taken

Debrief Script:

"Ok, that is officially the end of the interview, I really appreciate the amount of time you have given over this. But before you go, I genuinely want to thank you for giving up your time, you have given me a lot of time, and it is been incredibly helpful for my research. When the research is complete, and if you are interested, I would like to share with you a copy of the results. This can take some time, and I have, many more interview to conduct but if you can give me your email I can send you any output from this project.

Here is a participant information debrief sheet – please take it away. If there is anything you want to ask, please ask. Context relevant things – what are you up to for the rest of the day? Link to something they said earlier."

Appendix F: Participant Debrief Form

UNIVERSITY OF LIVERPOOL

UMASS LOWELL

PARTICIPANT DEBRIEF FORM

We sincerely thank you for taking the time to be involved in this project. The information we have collected here, coupled with that we collect from other members of the Untied States Armed Forces will be highly beneficial for future efforts to develop better decision-making training for Soldiers.

Whilst this research is not designed to include a re-living of trauma, there is a possibility that some adverse effects may occur as a result of completing this. Possible symptoms to look out for include:

- Changes in emotions such as feeling sad, anxious, disconnected, irritated, guilt, shame, self-blame
- Difficulty relating to other
- An increase in substance use
- Changes in sleeping i.e. nightmares, difficulty falling asleep, difficulty staying asleep
- Changes in eating habit i.e. eating more than usual or loss of appetite
- Avoidance of places, thoughts and feelings
- A lack of interest in activities
- Feeling detached or emotionally numb
- Feeling hopeless about a future
- Reduced concentration
- Feeling easily startled
- Suicidal thoughts or feelings
- Feeling alienated
- Physical aches and pains

If you feel that you have adversely suffered as part of taking part in this research please seek support from the following services:

SAVE PROGRAM (Boston based) - 1-888-844-2838
Veterans Crisis Line (Boston based) - 1-800-273-8255 or text 838255 – with online chat here - http://www.veteranscrisisline.net/ChatTermsOfService.aspx
The Soldiers Project (United States based) - (877) 576-5343
Dept. of Veterans Affairs Hotline (Staffed 24/7 with Mental Health professionals) - 800-273-8255
Real Warriors Live Chat (Staffed 24/7 with trained health consultants) – 866-966-1020
The PTSD Coach App (app to help identify and learn about PTSD symptoms) – available here http://www.ptsd.va.gov/public/pages/PTSDcoach.asp or via the iTunes Store)

If you have any questions about this study or your eligibility for it then please do not hesitate to ask the lead researcher, Mr. Neil Shortland (email: neil_shortland@uml.edu Tel: 8144044948)

This project is being supervised by Professor Alison who can be contacted upon L.J.Alison@liv.ac.uk

Appendix G: Experimental Paradigm

INFORMED CONSENT FORM

You are being invited to take part in a voluntary research project being conducted by Professor Laurence Alison, James Forest and Neil Shortland, MSc., researchers from the Department of Criminology and Justice Studies at the University of Massachusetts Lowell and the University of Liverpool. The purpose of this research is to investigate decision-making in high-stakes environments.

If you agree to participate, you will be asked to complete some survey questions and rate them as to your level of agreement. After this, you will be provided with a series of short scenarios which require you to choose between two options. Scenarios will be delivered via audio input. This experiment should take between 30 and 45 minutes.

This study is confidential meaning that no one, outside of the project team, will know whether or not you participated or what you responded to any question. All questions are optional. You are free to stop at any time or skip any questions that might make you feel uncomfortable. Your participation is entirely voluntary and you are free to withdraw at any time with no consequences.

There are no direct benefits to participating in this research. There is the potential risk that some of the scenarios may make you feel uncomfortable. If the study makes you uncomfortable, we recommend that you contact the UMass Lowell Counseling Services for assistance at 978-934-4331 or use their anonymous mental health screening tool at http://screening.mentalhealthscreening.org/RIVERHAWK.

If you decide to participate and complete in this study online, at the end of the survey you can opt to will be entered into a drawing to win one of five $50 Amazon gift cards (40 GBP). When you click to do this, you will be taken to separate survey to fill in your name and contact information. This information is in no way connected to the answers you gave as part of the research study. Once data collection has ended, participants' email addresses will be randomized and numbered. A random number generator will then be used to identify 5 numbers. These gift cards will then be purchased and emailed to the “winning” email addresses.

If you are enrolled in CRIM 3430/CRIM 4960 at the University of Massachusetts Lowell you will can also receive 3% extra credit to your final grade for completing this study as well as being eligible to enter the draw for a amazon gift card. At the end of the survey you can opt to do this by also going to the separate survey.

The Researchers and Professors teaching the above named classes will not download and/or receive the list of who participated in the research study until they have completed calculating grades. Then your Professor will adjust your grade up by 3%.

If you have any question feel free to contact Neil_Shortland@uml.edu or at 978-934-4045.

PARTICIPANT ACKNOWLEDGMENT:

By continuing to the survey portion of the study, you are indicating that you understand the potential risks and/or discomforts that have been described in this document and by the researcher. By continuing, you are indicating that you have read this document, had the opportunity to discuss any concerns and ask questions about the research, and understand the risks and consequences from participating in this study.

PRINCIPAL INVESTIGATOR SIGNATURE(S)

1. Printed Name: Neil Shortland Date: 19/10/16

Socio-demographic questionnaire

Gender

Male
Female

Age _____

Are you, or have you ever been, a member of the Armed Forces?

Yes
No

Are you, or have you ever been, a member of the Reserve Officer Training Corps?

Yes
No

If yes, which branch

Army
Marine
Air Force
Navy
Coast Guard

If yes, how many years have you/did you served in the Armed Forces ____

Are you, or have you ever been enrolled as a member of the Reserve Officer Training Corps?

Yes
No

Have you ever been on deployed to a theater of conflict (e.g., Afghanistan, Iraq)?

Yes
No

How many years have you been in the Armed Forces_____
What is (was) your rank _____

Are you, or have you ever been, a member of the Emergency services?

Yes
No

If yes, which branch

Police
Fire Service
Ambulance Service

If yes, how many years have you/did you served in the Emergency services ____

Need for closure scale

INSTRUCTIONS: Read each of the following statements and decide how much you agree with each according to your beliefs and experiences. Please respond according to the following scale.

1.....strongly disagree
2....moderately disagree
3.....slightly disagree
4.....slightly agree
5.....moderately agree
6.....strongly agree

nfc403	I don't like situations that are uncertain.
nfc504	I dislike questions which could be answered in many different ways.
nfc106	I find that a well ordered life with regular hours suits my temperament.
nfc408	I feel uncomfortable when I don't understand the reason why an event occurred in my life.
nfc509	I feel irritated when one person disagrees with what everyone else in a group believes.
nfc211	I don't like to go into a situation without knowing what I can expect from it.
nfc312	When I have made a decision, I feel relieved
nfc313	When I am confronted with a problem, I'm dying to reach a solution very quickly.
nfc315	I would quickly become impatient and irritated if I would not find a solution to a problem immediately.
nfc225	I don't like to be with people who are capable of unexpected actions.
nfc430	I dislike it when a person's statement could mean many different things.
nfc132	I find that establishing a consistent routine enables me to enjoy life more.
nfc133	I enjoy having a clear and structured mode of life.
nfc540	I do not usually consult many different opinions before forming my own view.
nfc241	I dislike unpredictable situations.

Maximization inventory

INSTRUCTIONS: Read each of the following statements and decide how much you agree with each according to your beliefs and experiences. Please respond according to the following scale.

1.....strongly disagree
2....moderately disagree
3.....slightly disagree
4.....slightly agree
5.....moderately agree
6.....strongly agree

Question	Score (1-6)
I usually try to find a couple of good options and then choose between them.	
At some point you need to make a decision about things.	
In life I try to make the most of whatever path I take.	
There are usually several good options in a decision situation.	
I try to gain plenty of information before I make a decision, but then I go ahead and make it.	
Good things can happen even when things don't go right at first.	
I can't possibly know everything before making a decision.	
All decisions have pros and cons.	
I know that if I make a mistake in a decision that I can go "back to the drawing board."	
I accept that life often has uncertainty.	
I usually have a hard time making even simple decisions.	
I am usually worried about making a wrong decision.	
I often wonder why decisions can't be more easy.	
I often put off making a difficult decision until a deadline.	
I often experience buyer's remorse.	
I often think about changing my mind after I have already made my decision.	
The hardest part of making a decision is knowing I will have to leave the item I didn't choose behind.	
I often change my mind several times before making a decision.	
It's hard for me to choose between two good alternatives.	
Sometimes I procrastinate in deciding even if I have a good idea of what decision I will make.	
I find myself often faced with difficult decisions.	
I do not agonize over decisions.	
I can't come to a decision unless I have carefully considered all of my options.	
I take time to read the whole menu when dining out.	

I will continue shopping for an item until it reaches all of my criteria.	
I usually continue to search for an item until it reaches my expectations.	
When shopping, I plan on spending a lot of time looking for something.	
When shopping, if I can't find exactly what I'm looking for, I will continue to search for it.	
I find myself going to many different stores before finding the thing I want.	
When shopping for something, I don't mind spending several hours looking for it.	
I take the time to consider all alternatives before making a decision.	
When I see something that I want, I always try to find the best deal before purchasing it.	
If a store doesn't have exactly what I'm shopping for, then I will go somewhere else.	
I just won't make a decision until I am comfortable with the process.	

Instructions

In the next section you will be presented with 16 scenarios. Some are military focused, others are dilemmas faced by Police, Fire, Ambulance services, and even University Professors. Each scenario will involve two decision points. After you have made your first decision the scenario will evolve and you will be presented with a second decision.

Both decisions are independent and decisions cannot be changed once they have been made.

The audio feeds for each decision point will not play automatically. Please press the play button when you are ready to hear the audio input.

Emergency Room Scenario

Hi Sir, we have a situation. I am with a family here in the emergency room. They say their 4-year old son fell off the back of a hobby horse onto a stone flooring and cracked his head open. He vomited and passed out and an hour later he died in surgery. We haven't yet been able to establish a cause of death. The mother wants to hug her son's dead body? Can I let her do that or will it compromise forensics! What do you want me to say?

5 ---------- 0 ---------- 5

Absolutely not I am unsure Yes, let her.

Second step:

Sir. They also have their daughter (Eleanor) who is 5 with them also. The dad is asking if he can take the daughter Eleanor home. Given I'm not 100% sure on cause of death of their son can I risk letting them take their other child home?

5 ---------- 0 ---------- 5

Absolutely not I am unsure Yes, let her.

Island Scenario:

"Hi Captain. So I am here with the Commander of the Afghan National Army. He's pretty frantic. He says that an Afghan patrol just got in a large firefight with a small group of insurgents in the middle of the local city. He says two of his men were killed and 2 were injured. He's also telling me that they think they saw one of Al-Qa'ida's senior leaders during the fight. They said that the insurgents fled after during the confrontation and are currently held up on a small island in the Euphrates river. It's getting dark here and the Afghan Commander wants your permission to launch an immediate assault on the island. Shall I give them the go ahead?"

5 ---------- 0 ---------- 5

No. I am unsure Yes

Second step:

"Captain. The Afghans were repelled again. 3 more died. They want us to send the Marines in with them before it gets too dark to do anything. Do you want us to launch a joint assault with them?"

5 ---------- 0 ---------- 5

No. I am unsure Yes

Tunnel Scenario

Hi Commander, there has been an explosion in Merseyside tunnel we have deployed the Police and Fire Services there now to help with evacuations and casualties. The problem is that we're hearing rumors that there is a secondary bomb in the tunnel which could go off at any time. We don't have a lot more information on the source, except the security services say it is a "credible threat." Do you want to call the officers out of the tunnel?

5 ---------- 0 ---------- 5

Keep them in there I am unsure Extract

Second Step:

"Sir, one of the officers is refusing to come out of the tunnel. He says he is with an 8 year old girl who is trapped. Her mums dead but she's only pinned in by some metal. He needs some pedal cutters to get her out and he won't come out until he's got those cutters. Some of the other officers have volunteered to go back with the cutters. Shall I let them go?

5 ---------- 0 ---------- 5

Order him to leave her I am unsure Send in the petal cutters

Doctor and Patient

Dr. Jackie here. We have a problem in the Children's ward. One of the children here is diagnosed with cancer and the doctors have prescribed chemotherapy and radiation. The issue is that the mother is opposed to Western medicine and believes that prayer will cure the disease. The father wants his daughter to receive the treatment, but he doesn't have legal custody. Without the treatment, the chances of survival for this girl are basically zero. What shall we do?

5 ---------- 0 ---------- 5

Give the treatment I am unsure Follow mothers wishes

Second step:

The family lawyer has just arrived and seen what we are doing. He is absolutely livid at the situation and threatens to sue us if we do not change our course of action. What do you want to do?

5 ---------- 0 ---------- 5

Change our plan I am unsure stick with the plan

Chamberlan Scenario

My Chamberlan if you would just like to take a seat?

I'm not fucking sitting down, I want to know why the fuck I was arrested at half past fucking 8 in the morning when all you had to do was wait 30, 35 minutes until the end of the school run. 3 kids. 3 fucking kids. YOU ARRESTED ME INFRONT OF MY KIDS. How dare you do that?

5 ---------- 0 ---------- 5

Outline reasons for his arrest I am unsure Continue

Second step:

It's a disgrace, I'm a fireman. People know me. Then you come, start taking me computer out. Everybody knows what that means don't they? Couldn't you have just waited? I am making a complaint. I want this down, and noted, that you have just made a humiliating fucking idiot out of me in front of everybody.

5 ---------- 0 ---------- 5

Take his complaint I am unsure Do not

Mountain fire scenario

Sarge, Private First Class Billings here. I am here with some Special Forces guys. They say they have intelligence about the base of operations for the local insurgents who have been targeting our base with missiles over the past month. The intel comes from an insurgents' brother. He says they have a base of operations at about 11000 feet in some nearby mountains. We've got UAV footage of the area. It's pretty grainy, but there is definitely some movement up there. They are likely to move by morning, so the window is time limited. They are saying this is our chance. Do you want me to mobilize air support?"

5 ---------- 0 ---------- 5

No. I am unsure Yes

Second step:

[Call from Squad Commander]. I've just heard from PFC Billings. What the hell are you doing. We are looking at the exact same intelligence as you! Undo your decision right now

Are you going to halt the aid raid?

5 ---------- 0 ---------- 5

Yes. I am unsure No

Negotiation

Hi Captain, we have a bit of a situation. I am downtown and there is a kid on top of a building. It's about 15 floors high. He has been up there for a few hours, but now he is threatening to jump if we don't move our perimeter further up the street. I don't want to aggravate him, but moving the perimeter could threaten public safety. What do you want me to do?

5 ---------- 0 ---------- 5

Keep the cordons I am unsure Move the cordons

Second step:

Captain, he is now demanding that we bring him a pizza? What should we do?

5 ---------- 0 ---------- 5

No pizza I am unsure Bring him a pizza

Rescue Mission

Captain, we have just heard from our guys in the field, they were being dropped by helicopter at a landing sight up in the mountains and they came under heavy fire. They aborted the landing but one of the officers fell out of the helicopter in all the confusion. The status of Soldier is unknown. The helicopter has landed in a safe spot on the valley floor but is requesting that they immediately turn around and go back to the landing zone to retrieve their Soldier."

5 ---------- 0 ---------- 5

Do not launch mission I am unsure Launch mission

Second Step:

"We have received a satellite feed from the ground that shows the Landing Zone where the Soldier was last seen. The footage is unclear but appears to show him in and amongst a lot of enemy Soldiers. We cannot confirm if he is free and fighting, captured, or has since been killed. The other guys still want to go after him. What do you want to do?"

5 ---------- 0 ---------- 5

Don't let them go I am unsure Let them go

Terrorist on a train

Hi Captain, we are down at the subway station, we have a potential incident involving a chemical weapon on an underground train. From our intel, we have a terrorist at the East side. Looking at our options we can either go in the East and tackle the perpetrator head-on; or we can go in the West, leave him where he is and start evacuating civilians. What do you want me to do?

5 ---------- 0 ---------- 5

Evacuate civilians I am unsure Go after the terrorist

Second step

Captain, further intelligence has told us that we have a couple of firefighters in there with him. They have subdued the terrorist but the chemical weapon has been released. Should we prioritise getting him out of there or focus on evacuating the contaminated civilians first?

5 ---------- 0 ---------- 5

Get the terrorist I am unsure Evacuate civilians

Tank Scenario

"Captain, I think we have a problem. We are heading North to support a large assault on a city. The thing is, I think we got our routes mixed and this route is not really suitable for our tanks and we are getting a lot of enemy contact. Vehicles are falling through bridges; it's a mess. We are a major piece of tomorrows battle but its night time, we barely have enough radios and half these guys have never seen a firefight before. Quite frankly we have no idea what lies ahead of us. We can turn back, but we won't make it to city in time to help the battle. What do you want us to do?"

5 ---------- 0 ---------- 5

Turn back. I am unsure Keep going

Second Step:

Captain. It's Lt. Col. Bieverson. I'm in charge of tomorrow's battle. What are you doing? How am I supposed to launch an assault on a city After what you have just ordered! Amend this situation right now!

5 ---------- 0 ---------- 5

Turn back. I am unsure Keep going

Study Abroad dilemma

Hi Professor, it is Professor Tawny. I am in Portugal on a study abroad program, but we have had an incident. Last night one of the students had too much to drink and knocked a bottle of wine off the roof of the accommodation. Luckily it didn't hit anyone, but this could have been a very serious incident. I have found out that the student has depression, and has been having a lot of other issues at home. Protocol says I should send him home but I am really worried about the negative effects for him in the long run if he is expelled from the trip and fails the course. I don't know if his confidence can handle the hit. What do you think we should do?

5 ---------- 0 ---------- 5

Send him home I am unsure Let him stay

Second step:

Hi Professor, we let him stay on the explicit instruction that he didn't drink again. However, last night at the group dinner I saw him having a complimentary glass of wine on arrival. I am worried about this escalating, but we are only a few days from finishing the trip. Is it worth sending him home – or should we turn a blind eye and let him stay until the end of the trip?

5 ---------- 0 ---------- 5

Let him stay I am unsure Send him home

Killbox Scenario:

Captain, we have a situation. We have a group of our Soldiers in the field and they have been spotted by a local Taliban network. They think there are about 1000 fighters coming their way. Their escape route is clear, but they think that they could stay and coordinate an airstrike which could eliminate a large chunk of the Taliban network. Do you want them to stay, or should I order them to head back to base?

5 ---------- 0 ---------- 5

Head back to base. I am unsure Stay

Second step:

Captain. They stayed and are planning the airstrike but they think their escape route has been cut off. They want us to launch the airstrike even if we do not have confirmation that they have escaped and are a safe distance away? What do you want to do?

5 ---------- 0 ---------- 5

Don't launch I am unsure Strike

Copeland

Interviewer: Ok, Mr. Copeland, if you can just take a seat, this is a urgent safety interview that..
Mr. Copeland: Right, you've got 30 fucking seconds, you've got 30 seconds to tell me why I'm here and that's it. Otherwise you'll be looking at the back of my fucking head for the rest of the fucking interview. You understand me?

5 ---------- 0 ---------- 5

Explain reasons for arrest I am unsure Continue

Second step:

Interviewer: Yeah, well let me just explain to you the nature of the interview first of all if I may?
Mr. Copeland: No. You got 30 seconds to tell me why I'm here, and I'm counting. You got 20….

5 ---------- 0 ---------- 5

Explain reasons for arrest I am unsure Continue

Mountain rescue

Captain. We have about 28 men up in the Valley, we are being fired at from all angles, and, while intelligence is pretty rough right now, our estimate is up to 200 Taliban-guys in the area. We are low on ammunition and we've been fighting up there for a good few hours now. We really need you and your men to go up there and help us. We know this will leave your base unmanned for a few hours, but will you help?

5 ---------- 0 ---------- 5

No. I am unsure Yes

Second Step:

Captain. The Taliban have been repelled and the Platoon is safe. The guys are tired and pretty shaken up but there were only a few minor shrapnel injuries to report. The Captain up here wants us to pursue the enemy into the Valley. They want a body count. What do you want me to do? Shall I tell the troops to get ready to go into the Valley, or shall we disobey him and head back to the base?

5 ---------- 0 ---------- 5

Head back to the base. I am unsure Pursue the enemy

Into the Wild

Captain. We gained intelligence on a potential Taliban stronghold. We have been here for about 30 minutes and there are shots being fired from the compound. We haven't seen any known insurgents, but I'm pretty sure they are baddies. We could escape, but I think we should strike this target while we can. Will you authorize air support?

5 ---------- 0 ---------- 5

No air support I am unsure Provide air support

Second Step:

Lt. Col. I've just heard from our German team in the field too. They were scouting a Taliban leader and have been spotted. They think a convoy of about 14 trucks, all with insurgents, are circling their area trying to find them. They may still be able to escape but the insurgents are getting closer. They need air support, but we can't support both requests. What do you want to do?

5 ---------- 0 ---------- 5

Germans I am unsure Americans

Mehsud

Interviewer: [outlines caution]. Do you understand?
Mehsud: Yes I understand but I do not give it any meaning of credit.

5 ---------- 0 ---------- 5

Continue with Interview I am unsure Repeat caution

Second step:

Interviewer: [outlines reason for arrest].
Mehsud: I don't respect you. I don't respect your law. I don't respect anything about your society. It means nothing to me. Why do you have the right to ask me questions? You are corrupt. Cancerous. You have no dignity.
Interviewer: Mr. Mehsud, are you not willing to talk to me? It is your right to not talk to me.
Mehsud: Answer me this. Do you drink alcohol?

5 ---------- 0 ---------- 5

Continue as planned I am unsure Answer the question

Decision Difficulty Questionnaire

(used after each scenario)

These decisions were very difficult

1 ---------- 100

Strongly disagree Strongly Agree

I would need more time to decide

1 ---------- 100

Strongly disagree Strongly Agree

I didn't ponder for a long time on these decisions

1 ---------- 100

Strongly disagree Strongly Agree

I feel ambivalent about these decisions

1 ---------- 100

Strongly disagree Strongly Agree

For these decisions, I feel certain which option to choose

1 ---------- 100

Strongly disagree Strongly Agree

I wanted more information before I made my choices

1 ---------- 100

Strongly disagree Strongly Agree

Sacred Values Measurement

(original; Tanner, 2007)

Please rate your level of agreement with the following statements about [insert value here]

1. My stance on this issue might change over time

1 ---------- 7

Strongly disagree Strongly agree

2. I would not change my opinion, no matter what the costs

1 ---------- 7

Strongly disagree Strongly agree

3. I would have problems making concessions on this topic

1 ---------- 7

Strongly disagree Strongly agree

4. There are principles involved in this topic that we should defend under any circumstances

1 ---------- 7

Strongly disagree Strongly agree

Values

1. Protecting the life of people under my command
2. Protecting the life of a fellow Soldier
3. Protecting the life of a civilian
4. Completing the mission

5. Capturing, or killing, a known enemy
6. Avoid blame for my actions
7. Avoiding negative repercussions for my actions
8. Acting within the law
9. Obey the orders of a superior
10. Everyone’s right to free will
11. Need to exert my authority over others

PARTICIPANT DEBRIEF FORM

We sincerely thank you for taking the time to be involved in this project. The information we have collected here, coupled with that we collect from other members of the Untied States Armed Forces will be highly beneficial for future efforts to develop better decision-making training for Soldiers.

Whilst this research is not designed to include a re-living of trauma, there is a possibility that some adverse effects may occur as a result of completing this. Possible symptoms to look out for include:

- Changes in emotions such as feeling sad, anxious, disconnected, irritated, guilt, shame, self-blame
- Difficulty relating to other
- An increase in substance use
- Changes in sleeping i.e. nightmares, difficulty falling asleep, difficulty staying asleep
- Changes in eating habit i.e. eating more than usual or loss of appetite
- Avoidance of places, thoughts and feelings
- A lack of interest in activities
- Feeling detached or emotionally numb
- Feeling hopeless about a future
- Reduced concentration
- Feeling easily startled
- Suicidal thoughts or feelings
- Feeling alienated
- Physical aches and pains

If you feel that you have adversely suffered as part of taking part in this research please seek support from the following services:

SAVE PROGRAM (Boston based) - 1-888-844-2838
Veterans Crisis Line (Boston based) - 1-800-273-8255 or text 838255 – with online chat here - http://www.veteranscrisisline.net/ChatTermsOfService.aspx
The Soldiers Project (United States based) - (877) 576-5343
Dept. of Veterans Affairs Hotline (Staffed 24/7 with Mental Health professionals) - 800-273-8255
Real Warriors Live Chat (Staffed 24/7 with trained health consultants) – 866-966-1020
The PTSD Coach App (app to help identify and learn about PTSD symptoms) – available here http://www.ptsd.va.gov/public/pages/PTSDcoach.asp or via the iTunes Store)

If you have any questions about this study or your eligibility for it then please do not hesitate to ask the lead researcher, Mr. Neil Shortland (email: neil_shortland@uml.edu Tel: 8144044948)

This project is being supervised by Professor Alison who can be contacted upon L.J.Alison@liv.ac.uk

Appendix H: Call for Recruitment

Can you make hard choices?

Then you can help us understand decision-making in extreme environments

Study Outline: We are looking for members (and veterans) of the Armed Forces, Emergency service personnel and civilians (18 years of age or over), to complete a series of scenarios that involve you making hard choices in military, police, and even workplace situations.

The study will take 30 – 45 minutes and will involve you navigating 16 challenging scenarios.

What will I get for participating? Online participants will enter a prize draw to win 1 of 5 **$50 amazon gift cards**. In-person participants (conducted at the University of Massachusetts Lowell) will be **paid $10** for their participation.

How your participation helps? The results of this research could be used to help select and train members of the United States Armed Forces.

What do I do if I want more information? If you would like any more information on the research, what it entails and how we aim to use it to support the United Stated Armed Forces, please email neil_shortland@uml.edu, or call at 978-934-4045.

To take part in this study online click on the link below

https://livpsych.az1.qualtrics.com/SE/?SID=SV_0xioWJWfGO3Y85v

To take part in this study in-person email neil_shortland@uml.edu

Appendix H: Scatterplot distributions

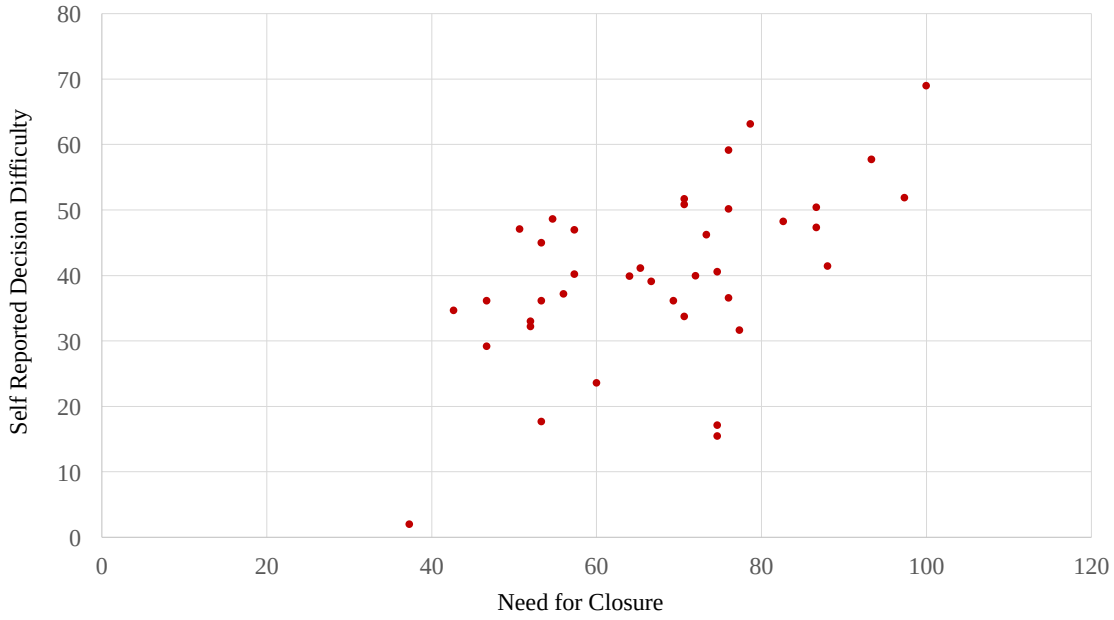

Figure 1: Scatterplot of Need for Closure and Self-Reported Decision Difficulty for Soldier Participants (from Chapter 7).

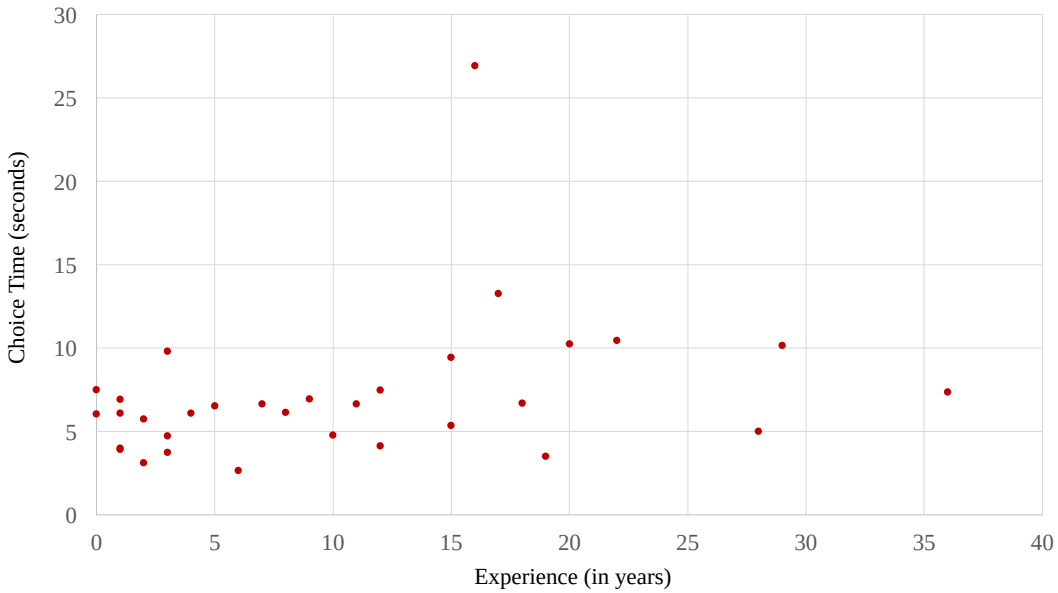

Figure 2: Scatterplot of Experience and Choice Time for Soldier Participants (from Chapter 7).

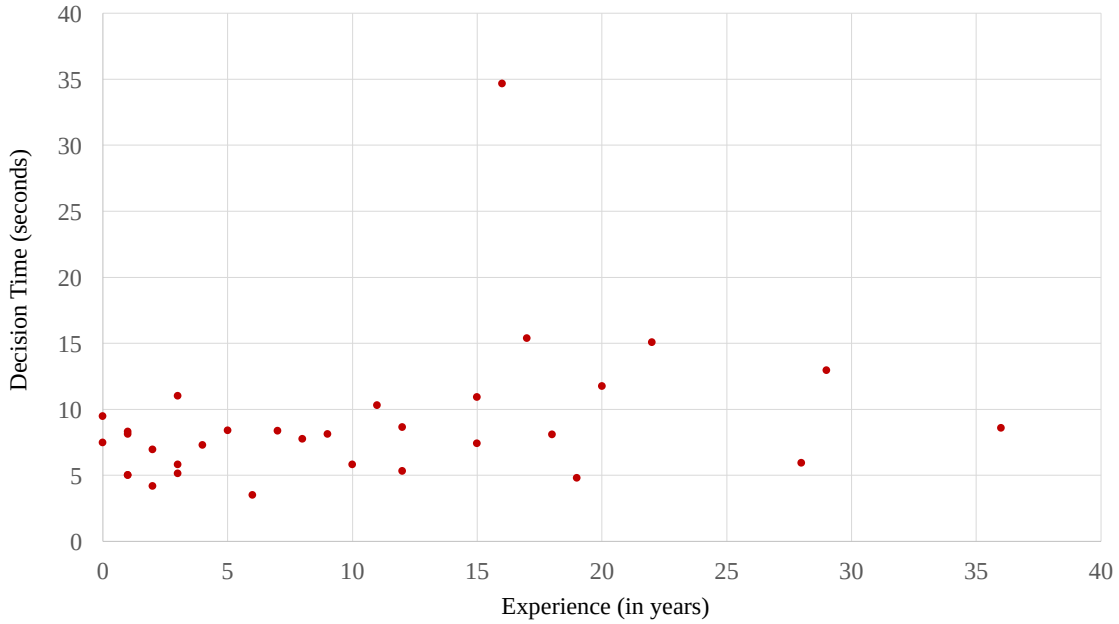

Figure 3: Scatterplot of Experience and Decision Time for Soldier Participants (from Chapter 7).

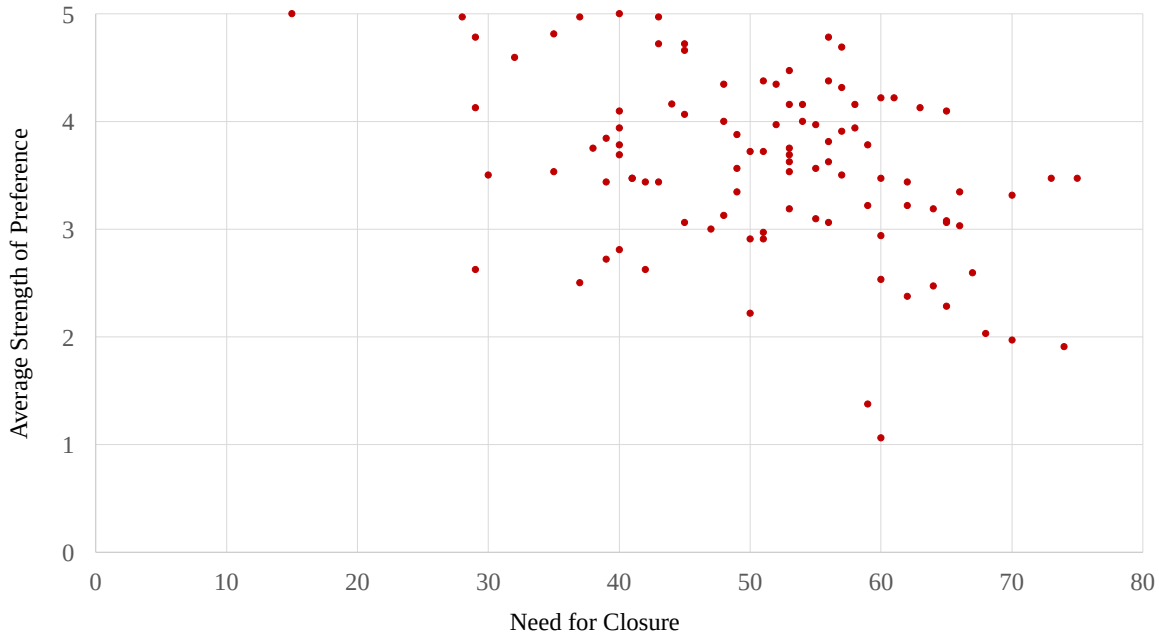

Figure 4: Scatterplot of Need for Closure and Strength of Preference (from Chapter 8).

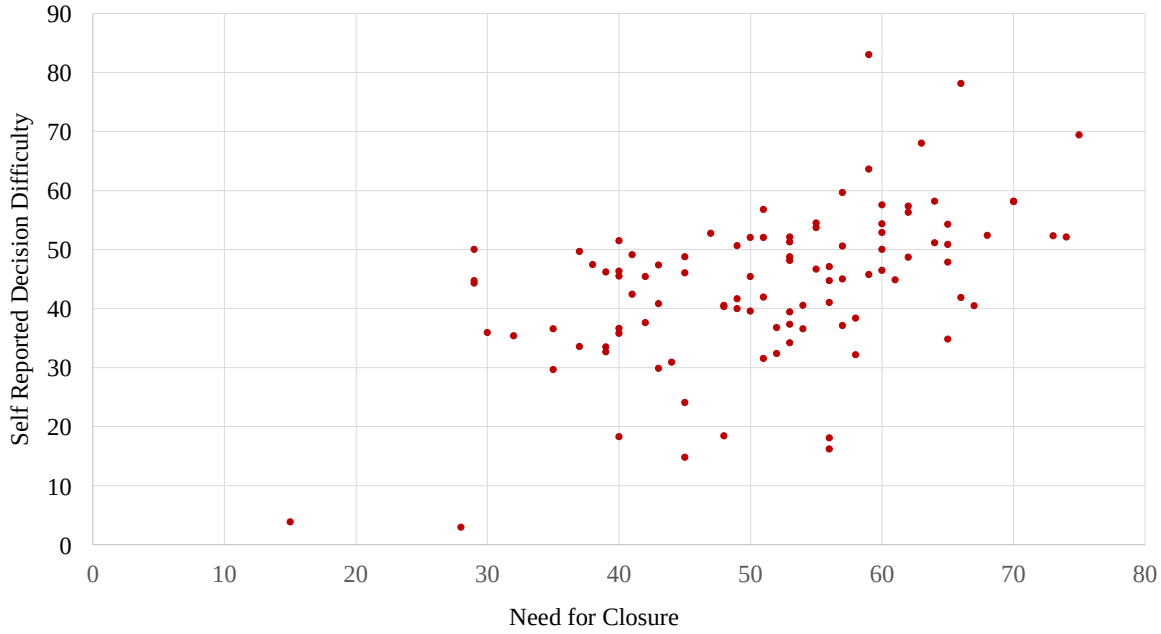

Figure 5: Scatterplot of Self-Reported Decision Difficulty and Need for Closure (from Chapter 8).

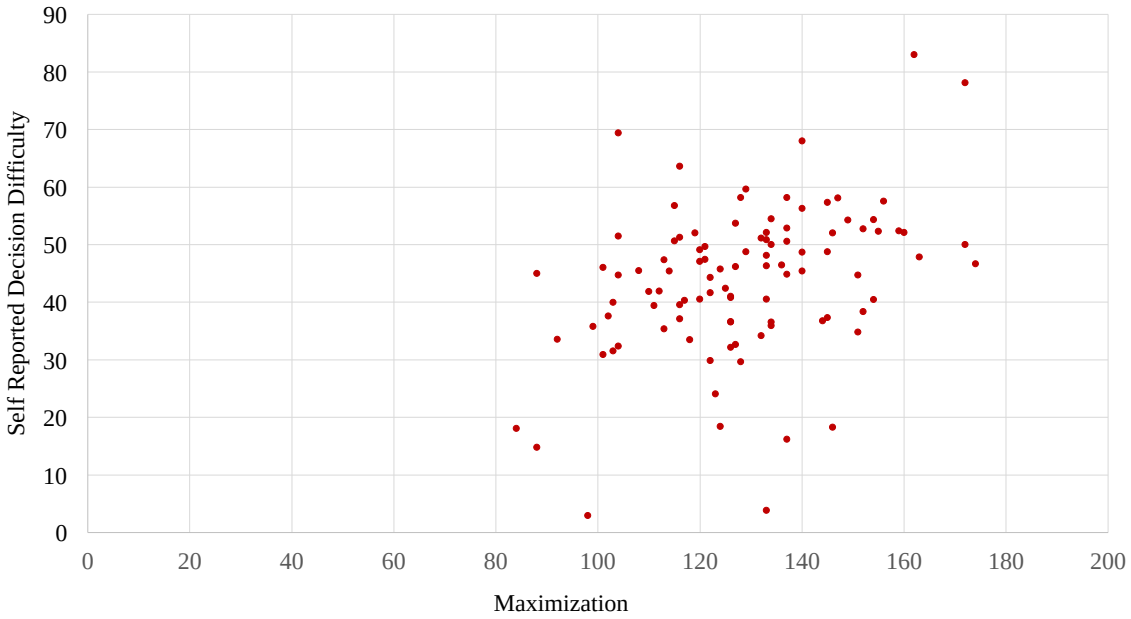

Figure 6: Scatterplot of Self-Reported Decision Difficulty and Maximization (from Chapter 8).

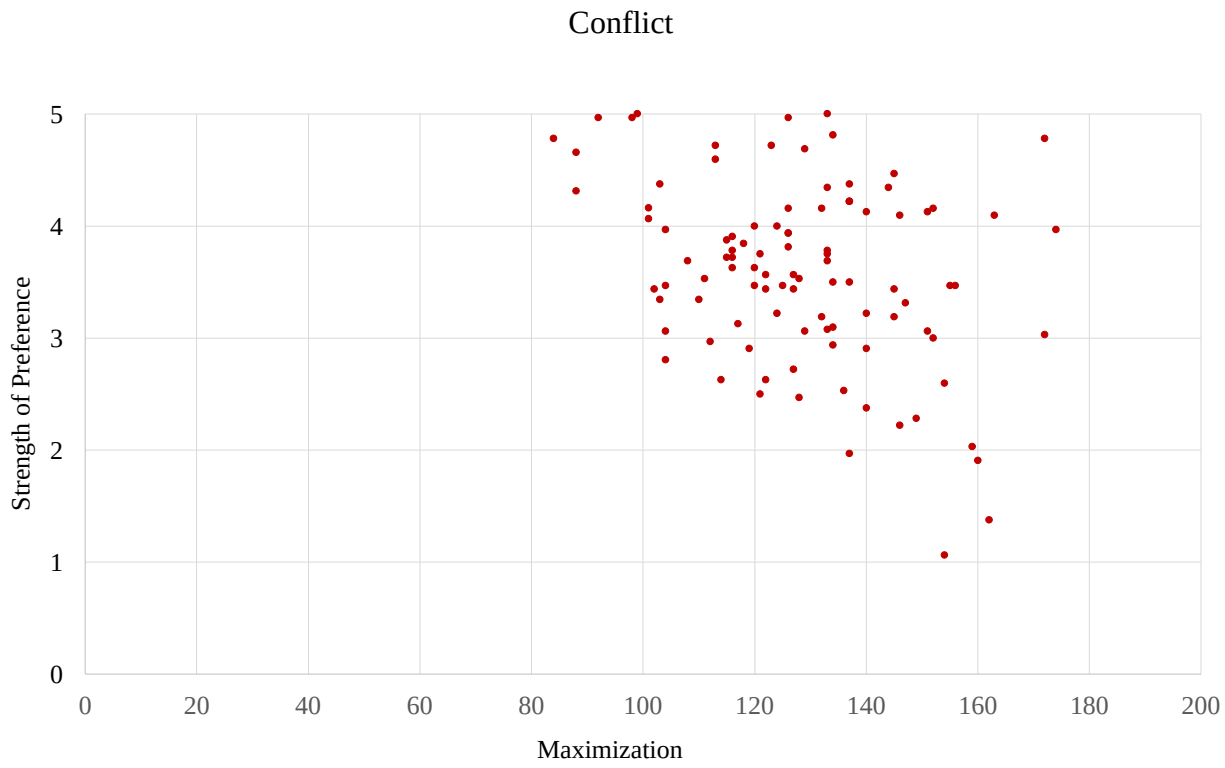

Figure 7: Scatterplot of Strength of Preference and Maximization (from Chapter 8).