An Exploration of Unintended Consequences: The Relationship Between U.S. Military Technologies and Risk Factors for PTSD in Soldiers

by

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Class of 2015

A thesis submitted to the faculty of Wesleyan University in partial fulfillment of the requirements for the Degree of Bachelor of Arts with Departmental Honors in General Scholarship

Middletown, Connecticut April, 2015
Acknowledgements

When I first began researching topics related to my thesis, I did not really know why I wanted to write about this. Mostly I was, and have always been, fascinated by war; by the soldiers who shoulder the brunt of combat, the institution that placed them there for whatever reason; and the jarringly different way we understand war if we are not personally, or spatially, involved from those who are. This journey began in tenth grade, when I first interviewed my father about his experience being drafted by the Army but instead enlisting in the Air Force during the Vietnam War. My thesis is dedicated to him. Six years later, here is the essay I started writing then.

This thesis would not have been possible without my advisor, Joslyn Barnhart Trager. Without her (originally blind vote of) confidence and commitment, I would never have been able to accomplish this. I cannot express my gratitude enough.

Thank you to my family for asking me to re-explain my thesis so many times that I was actually able to come up with a thesis statement. And, of course, for the ongoing support and appropriate doses of sarcasm.

Thanks to housemates and friends (you know who you are) for the food, love, and reality checks. But mostly the love.

This thesis is also dedicated to my grandmother.
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Chapter One: Introduction

The past century saw rapid advancements in technology, especially the technologies used by the United States military (M. Boot, 2006). The United States spends more on military technology than any other country in the world (Walker, 2014). Advancements made by the military have changed the way wars are fought, and expected advancements promise to continue to change warfare. Philosophers and military analysts argue that this trend is toward a post-human warfare, in which technology intelligence will trump human intelligence, and human bodies in war will be supplemented, if not entirely replaced, by machines and robots (Coker, 2002; O’Hanlon, 2000; Radine, 1977; Singer, 2009). While such an extreme is not only controversial but also projected much farther into the future, current technologies already take steps in this direction. Many new technologies minimize human involvement or proximity in order to minimize casualties of U.S. soldiers (Coker, 2002; Matthews, 2013). Unmanned Aerial Vehicles (UAVs), for example, remove humans from the combat site, guaranteeing their safety even if the aircraft is in jeopardy (Strawser, 2013). Other technologies improve weapons accuracy and speed, such as GPS and radar sights (M. Boot, 2006). Technology also works to more effectively train and equip soldiers. Simulation technology, through both computer (2D) simulations and Virtual Reality (VR), minimize costs of realistic training while attaining superior unit cohesion and skills preparation (Grossman, 2009; Radine, 1977). Night vision goggles, thermal vision, and advanced armor such as Kevlar suits enhance soldiers’ abilities in war, making them less destructible and more omniscient (M. Boot, 2006). Collectively, these technologies contribute to the larger goals of
military technology: to create a faster, cleaner (both in weapons accuracy and reducing U.S. soldier casualties), and more efficient, effective, and powerful military (M. Boot, 2006; Coker, 2002; Dyer, 1985; Marlantes, 2011; O'Hanlon, 2000; Singer, 2009).

Simultaneously, rates of posttraumatic stress symptoms and other combat-related disorders are rising (Hoge, Auchterlonie, & Milliken, 2006; Milliken, Auchterlonie, & Hoge, 2007; Thomas et al., 2010). While specific statistics are often controversial, the overall trend shows that the rates of mental illness in U.S. veterans are not decreasing, even though we understand more about combat-related disorders than we ever have and have more treatment resources than were previously available (Hoge et al., 2006). The Veterans Association is continually under scrutiny by the media and public for their availability and quality of diagnosis and treatment (Cohn & Gilberd, 2009); the high rate of veteran suicides is frequently reported (Coleman, 2006; Rate & Person-Years, 1990), as are veterans’ high rates of drug use (substance abuse often hides undiagnosed trauma-related disorders in veterans (Ouimette, Read, & Brown, 2005)); and the United States military reports that posttraumatic stress disorder is the single largest psychological injury of war, with one study reporting that the rate of posttraumatic stress disorder recently increased 232 percent in returning veterans (Cohn & Gilberd, 2009).

Little has been published in any discipline, however, relating the changes in technology to the changes in rates of posttraumatic stress reactions. Within Psychology, specifically, there is a startling lack of research examining the effects of specific technologies on soldiers’ mental health. Methodological difficulties account
for much of this. A controlled study testing whether killing people while wearing night vision goggles causes more dehumanization of the targets, for example, is entirely impossible. Similarly, longitudinal studies that document as many details as possible about how soldiers interact with technology during war and whether/how they develop posttraumatic stress responses years later are difficult and expensive. Additionally, the findings would not be available until the technologies had already been implemented for years. Technological advancements outpace the ability to research their effects, especially since their long-term effects will not happen for years. Additionally, research funded by the military primarily seeks to make soldier training more effective and their technologies more potent, meaning that the unintended consequences of these technologies for soldiers’ mental health are left completely unexplored. Even with these difficulties, studies can test predictive factors and provide strong evidence that increases our understanding of what soldiers go through in combat. These studies are important to widen and deepen our understanding of psychological processes in soldiers.

There is ample reason to expect, however, that new technologies employed by soldiers impact their psychology in meaningful and significant ways that are important to understand. Simulation technology, for example, such as virtual reality, seeks to increase competency and unit cohesion (Radine, 1977), which are important factors indicating perception of control in combat (Jones, Sparacino, Wilcox, Rothberg, & Stokes, 1995). Perceiving control during trauma is a strong protective factor against developing posttraumatic stress disorder (Bolstad & Zinbarg, 1997; Herman, 1997). This thesis, therefore, provides one of the first systematic
examinations of ways specific technologies used in warfare affect whether and how soldiers develop posttraumatic stress disorders. It draws on existing psychological research and theories and develops a series of hypotheses evaluating the links between specific technologies and long-term effects on soldiers’ reactions to combat trauma. This is important because it will expand the understanding of risk and protective factors to include the risks and benefits of implemented military technology in terms of PTSD. Knowing this will help us develop better preparation and treatment for soldiers prior to, during, and after combat. It will also point out faults in technology used by soldiers that could increase their risk for developing posttraumatic stress disorder. Redesigning this technology will help the military not just focus on producing effective soldiers, but will also more effectively support the mental health of soldiers in the future, particularly as technology becomes even more pervasive in soldiers’ lives.

Existing research on how technology interacts with warfare is published by philosophers, historians, and military analysts. John Keegan’s *The Face of Battle* (1976), Paul Dickson’s *The Electronic Battlefield* (1976), O’Hanlon’s *Technological Change and the Future of Warfare* (2000), P.W. Singer’s *Wired for War* (2008), and Max Boot’s *War Made New* (2006), epitomize this pattern, tracking what modern war is, how technology is involved, and what has changed and will continue to change on the battlefield. While these accounts delve into the implications of technology for engaging in conflict, they do so at a broad systems or societal level, where the subjects considered are larger than any individual. For example, discussion of the future implementation of robots into warfare explores the societal pressures and
expectations associated with this technology rather than the viewpoint of the soldiers working alongside the robots (Singer, 2009). Occasionally a comment references the individual soldier, but rarely is the soldier a focus in these historical military studies.

Existing research in psychology explores how to make technology more effective, but it does not explore the unintended consequences of technology on soldiers’ mental health. One example of an exploration of unintended consequences of technology is an anthropological take on a psychological concept. Vasquez (2008) discusses how the use of night vision goggles makes the enemy appear less human, making it easier for soldiers to kill when they otherwise would have refrained from shooting, and making it easier to commit atrocities. No psychological studies examine this same subject. Rather, psychological studies specific to night vision goggles examine issues such as whether distance estimation is accurate while wearing night vision goggles (Niall, Reising, & Martin, 1999). This is indicative of the trend in psychological research relating specifically to technology and soldiers: how psychological studies exist in detailed forms seeking to discover ways to make technology more effective to then make soldiers more effective. Exploring how specific technologies might affect soldiers’ mental health post combat, however, is significantly underresearched.

**Frontlines: A Case Study**

One important counterexample exists. Psychological researchers have begun to focus on the effect of the changing nature of frontlines on soldiers’ mental health. New technologies in war that increase firepower, accuracy, and intelligence exist alongside globalization (especially in terms of information technologies), which
allows smaller, often nonstate actors with fewer resources to gain allies, weapons, and equipment and effectively operate at an asymmetric level (M. Boot, 2006). This combination of new technologies and weapons has manipulated the frontlines of war (Marlantes, 2011). World War I saw clear frontlines for troops on the ground, notable through trench warfare (M. Boot, 2006). However, with the invention of aircraft and missiles, pilots have dropped bombs behind enemy lines, beginning to blur the lines of war (Norwitz & Naval War College (U.S.), 2008). Now, aircraft can drop forces behind enemy lines to conduct dangerous operations in territory previously unreachable by traditional tactics (M. Boot, 2006). Separately, guerilla tactics by actors strategically working against a technologically superior enemy have contributed to these blurry frontlines. Working to stay invisible and unpredictable, these actors are constantly moving (M. Boot, 2006; Norwitz & Naval War College (U.S.), 2008). Though their firepower is typically inferior to their opponents’, they still can cause damage continuously and effectively (Marlantes, 2011). This is most notable currently through Improvised Explosive Devices, or IEDs, which have been used consistently against U.S. and Allied troops in operations in Iraq and Afghanistan (Wilson, 2006). These devices are unpredictable and powerful, responsible for not only many casualties (Kelly et al., 2008), but also for continuing the trend of unpredictable and blurred frontlines of war (Norwitz & Naval War College (U.S.), 2008). Frontlines become less clear without a visible enemy (M. Boot, 2006). For example, when actors are hidden within civilian populations, infantry troops and aircraft responses enter urban areas. Battling within civilian areas with a less obvious, or often entirely unclear, distinction between civilian and combatant has raised not
only legal and moral issues, but also changes to the historic understandings of frontlines in battle (M. Boot, 2006).

Without traditional frontlines, soldiers are not fighting large battles, where they generally knew when to expect combat and fought a visible enemy (O'Hanlon, 2000). Rather, they are more often than not constantly in combat, at risk of encountering hidden enemies or bombs anytime they leave a base. Even on base, they are still prone to mortar blasts and other attacks (M. Boot, 2006). This creates a constantly risky environment, devoid of the frontlines of previous conflict that created gradations of risk, with less risk the farther away the frontline (Norwitz, 2008). For soldiers on the ground, this creates a constant environment of unpredictability and risk, always about to be in battle, but never sure when (Coker, 2002).

For U.S. soldiers, this effectively means that they are exposed to combat for the entirety of their time deployed. This is present in the way modern deployment is discussed by those in the military, which emphasizes that because they never know when they will encounter an explosive or enemy, they are constantly in danger. It is much more a matter of luck than skill, for small units can easily be eliminated by an IED without any warning or time to make a skillful decision (Marlantes, 2011). The casualty and fatality rate may be lower, but the constant exposure to combat stress is qualitatively different.

Psychologists have explored the important impact that this changing nature of frontlines has had on soldiers. Studies show that soldiers who are exposed to the most combat are the most likely to develop posttraumatic stress symptoms and disorders (Herman, 1997). Soldiers are now exposed to significantly more combat because
they are continuously exposed to combat through the new lack of frontlines. The changing nature of frontlines (a product of technology), therefore, presents a significant risk factor for soldiers.

Psychological studies also find that a higher percentage of soldiers are surviving heavier combat than used to survive (Boscarino, 1996), and that soldiers who receive combat-related injuries are more likely to develop posttraumatic stress symptoms (Koren, Norman, Cohen, Berman, & Klein, 2014). The first finding is partially explained by new protective technologies of war, and the second has implications for surviving soldiers, and helps explain why a larger percent of soldiers are developing posttraumatic stress symptoms.

Protective technologies and medical technologies have decreased the fatality rate of U.S. soldiers. Body armor has changed drastically over the past few decades with the invention of and subsequent improvements on the Kevlar body armor. This creates lightweight, flexible body armor for soldiers that protect their core well (M. Boot, 2006). This is speculated to be one of the most significant reasons more soldiers survive injury now than in historical conflicts (Gawande, 2004; Kelly et al., 2008). This has also almost unilaterally changed the predominant characteristic of combat injuries. Before, injuries to the chest and abdomen were much more common than they are now, largely courtesy of the increased protection to these body parts (Kelly et al., 2008). Now, the majority of injuries are to soldiers’ extremities. Over two-thirds of injuries in combat are to upper extremities, lower extremities, or both (Kelly et al., 2008; McFarland, Hubbard Winkler, Heinemann, Jones, & Esquenazi, 2010).
Surgical advancements over the past few decades have enabled procedures that historically were either impossible or too far away from those capable of completing them. Surgical advancements rely on scientific discovery but also computer technology and communications technology. These interact with each other, informing new hypotheses and techniques. Because of this, more soldiers are saved now in post-combat medical care than were before (Coleman, 2006).

Historically, psychological common sense argued that physical injuries were actually a protective factor against developing posttraumatic stress disorder (Koren et al., 2014). This hinged on the idea that the physical injury bears the brunt of the trauma, that the psychological injuries that could have taken place are instead rerouted to the physical injury. Since there is a physical representation of the wound, once it is healed, so is the psyche. While at least one study supported this hypothesis, more recent research has completely undermined this view (Koren et al., 2014).

The new research shows that incurring a physical injury is a risk factor for developing posttraumatic stress disorder, not a protective factor. An important caveat in this discussion is that the physical trauma occurred during the traumatic event from which psychological trauma would also stem. Without this connection, the physical injury is less potent. Recent studies indicate that soldiers with a physical injury are eight times more likely to experience development of PTSD and posttraumatic stress symptoms compared to those experiencing injury-free trauma (Koren et al., 2014). This finding further clarified that “injury elevates hyperarousal symptoms in all subjects, but has a special effect on re-experiencing symptoms among those who go on to develop PTSD” (Koren et al., 2014, 279). Since re-experiencing symptoms
encompass nightmares, intrusive memories, etc., it makes sense that the trauma and suffering of having an injury could exacerbate the trauma that caused it.

Statistically, more soldiers who see combat survive now than used to survive. While the nuances of this are difficult to tease apart, it is clear that fewer soldiers die during and after exposure to heavy combat than died in conflicts prior to the twenty-first century (Gawande, 2004). This means that a higher percentage of soldiers who see heavy combat are surviving post combat (Jones et al., p. 1995). With a higher percentage of soldiers surviving heavy combat (Gawande, 2004), this suggests that a larger percentage of soldiers develop severe posttraumatic stress disorder.

Fewer fatalities statistically mean that more soldiers are surviving more severe combat, and surviving injuries that historically would have meant certain death. Studies also indicate that soldiers with combat-related physical wounds are more likely to develop post-traumatic stress disorder versus soldiers who see the same combat but with no injuries. Collectively, this indicates that modern warfare, while statistically incurring fewer fatalities, provides more serious in-combat risk factors, overall making it more likely for soldiers to develop posttraumatic stress disorder.

These studies suggest the psychological effects of a specific way technology has affected soldiers. However, these studies did not seek to explore the effects of specific technology, but examined more recent trends that happened to align with technological trends. In similar ways, the following chapters seek to explore the ways specific technological advancements affect soldiers’ reactions to combat trauma. However, in these cases, few psychological studies have been done to support hypotheses and conclusions as strongly as the above example. Because of this, the
application of related psychological research will be incorporated into hypotheses and suggestions for future research. This is with the intent to further elucidate the nuances of soldiers’ interactions with modern combat. The suggested research would have important implications for the preparation and treatment of soldiers.

**Chapter Contents**

Chapter Two presents an overview of the relevant concepts and literatures in the two primary areas linked by this thesis. The first section describes the important technological advances that impact contemporary soldiers. The second section addresses existing research within psychology on soldiers’ well-being and the current understanding of combat trauma. The chapter concludes with a discussion of relevant risk factors that will consistently play a role within this thesis. This thesis specifically discusses the US Armed Forces, but it has implications for other militaries and countries as well.

Chapters Three and Four expand on the foundation laid out in Chapter Two. They examine the relationship between relevant psychological theories and specific military technologies and propose a series of specific hypotheses with descriptions of plausible research designs. Chapter Three specifically addresses technology used before warfare, and in particular, technology used in training. Military branches heavily train their soldiers before they are deployed. This foundation that all soldiers receive is particularly important because of its evolution since the mid twentieth century, largely informed by technological advancements. Most notably, this is seen through the development of simulations and increasing technological involvement in simulations. Psychological theories considered are theories of perceptions of control
and perceptions of reality. Ways this research is relevant for understanding soldiers’ ability to integrate and cope with trauma are also considered.

Chapter Four addresses the potential psychological impact of technology used during warfare, and in particular on ways technology manipulates distance between soldiers and their targets. The psychological theories considered are theories of psychological distance, dehumanization, utilitarian moral decision-making, and the diffusion of responsibility. Related risk factors for developing posttraumatic reactions are considered in response to these theories.

This thesis will conclude examining the future of technological developments and how the presented hypotheses and future research will create the best possible foundation for implementing technology in a way that better prepares and treats soldiers’ trauma reactions.
Chapter Two: History and Context

This chapter provides a foundation from which the following chapters will build. Chapters Three and Four focus on technology used prior to combat and technology used during combat (respectively) and how they interact with psychological trauma. Understanding the basics of U.S. technology development for the military is especially important for understanding how historical technological trends will continue into the future. The intersection of technological trends, including the specific technologies emphasized in my thesis, and psychological research of soldiers, the military, and trauma is important for understanding the context in which the following chapters take place.

I. Technology and the Changing Nature of Warfare

Technological advances used in the military invariably interact with soldiers, the actors in warfare. This thesis is concerned with soldiers’ experience of war; as such, relevant technology is separated into two categories that align with soldiers’ experiences: technology used before warfare and technology used during warfare. These two categories are accompanied by societal and historical trends, informing their evolution.

Technological Trends

The First and Second Industrial Revolutions brought more and better technology and equipment to the military, and the Information Age improved on these further. This push for bigger and better weapons, vehicles, aircraft, gadgetry, etc. was heavily influenced by both the United States’ casualty-averse mentality
(Coker, 2002; Dyer, 1985) and its “instinctive search for quantifiable data and predictability in war” (Dyer, 1985) 139). With stealth planes, for example, they were less likely to be shot down, saving American lives; with Kevlar vests and nearly indestructible tanks, soldiers were even more protected; and with Unmanned Aerial Vehicles (UAVs), even if the plane was shot down, none of the operating soldiers could be injured (M. Boot, 2006). Information Age technology such as Global Positioning System (GPS), more effective radars, and thermal and night vision capabilities also give a more omniscient perception to the military (M. Boot, 2006). With more information available, the mentality explains, there would be more predictability, and thus, more control in war.

The twentieth and early twenty-first centuries produced the current set of weapons, equipment, vehicles, and aircraft that the U.S. Armed Forces use in modern warfare. While the early twentieth century saw an exponential growth in propulsion systems and designs for vehicles, ships, and aircraft (O'Hanlon, 2000), this growth has become much more gradual. And while new models, including stealth planes, UAVs, and the M1 Abrams Tank exist, they are used alongside older models. The Air Force, for example, still uses B-52H bombers from 1962, and helicopters from the Vietnam War era are still utilized by the Marine Corps (O'Hanlon, 2000). However, even with older systems designs, they are far from outdated or ineffective: “What has been changing with great rapidity since the mid-1970s is the communications, targeting, surveillance, and ordnance technology that can make such ‘legacy’ systems considerably more potent” (M. Boot, 2006, p. 419). In other words, while the
functional mechanisms of the vehicles have not changed, their firepower, accuracy, and gadgetry has advanced enough to give these vehicles a more powerful makeover.

This technology, courtesy of the Information Age, is continually growing and changing, and has implications for the future of warfare, where robotics are already entering the field. Many philosophers and military analysts speak of a post-human warfare, where humans will be subordinate to technology and potentially not even present for the conflict (Coker, 2002; Singer, 2009). Others, however, say that no amount of technology will change one basic principle of war: that “Winning wars, as distinct from winning battles, will continue to require controlling territory, which in turn will require substantial presence of ground troops” (M. Boot, 2006, p. 432). The track of this future technology is considered more thoroughly in the conclusion.

**Technology Before Warfare**

Technology used before warfare has been influenced by the changing nature of training, and the changing nature of training has been largely enabled by new technological capabilities. Training aims to produce the most effective, efficient, and competent teams of soldiers possible (Prensky, 2001). Recognized inefficiencies in this system spur change, and recently, these inefficiencies geared training toward implementing simulation technologies and psychological methods of training behavior. While human factors (ergonomics) and psychological research seek to explore the effectiveness of these methods, they do not study unintended consequences on soldiers’ interactions with combat trauma (the focus of Chapter Three). Much of this research is funded by the military as it seeks to enhance the training of soldiers and to isolate any inefficiencies. However, without broadening the
goals of existing research, the military fails to account for unintended consequences on soldiers’ mental health that psychology (and other disciplines such as ergonomics) could explore.

During the twentieth century, S.L.A. Marshall, a military historian, published findings that only about fifteen percent of soldiers in the U.S. Army were actually firing their weapons against the enemy (S. L. A. Marshall, 2000), suggesting that military training was ineffective at preparing soldiers to shoot and kill during combat. While not the only factor, this was an important one that shifted the focus of basic training to incorporate more realistic aspects of combat, like human-shaped targets (Grossman, 2009).

Training that replicates combat through role plays and simulations rose in popularity during the twentieth century, predicated on the theory that presenting a version of the situation beforehand would be more effective in generating the desired outcome once in reality (Radine, 1977). This has precedence. Sports teams discuss plays and build strength and endurance as separate activities, but they also run the play as realistically as possible before actually competing (MacDonald, 1996). This

1 Critique of this finding argues that Marshall did not use a replicable or valid scientific method, so we have no way of knowing whether this was actually the case or not (Chambers, 2003; Spiller, 1988). However, similar studies of previous wars corroborate the gist of his finding, even if the actual percentage of soldiers who did not fire their weapons is in question (Grossman, 2009). Double- and triple-loaded muskets from the Civil War indicate that soldiers were purposefully overloading their weapon to appear as if they were firing (Grossman, 2009). Casualty studies also indicate that many more casualties on both sides should happen than usually do, even taking into account a wide margin for error (Grossman, 2009). Many analysts argue that this is because soldiers were not shooting to kill; they were shooting upwards or toward the ground rather than directly at the enemy (Grossman, 2009). Whether or not S.L.A. Marshall’s finding was accurate, it was enough of a scare for the U.S. Army and other branches of the U.S. Armed Forces to incite a revolution in marksmanship and combat training, geared toward teaching soldiers how to shoot at humans in more realistic drill settings rather than at a target unconnected with any moral or emotional significance (Grossman, 2009).
theory particularly emphasizes the benefits of replicating reality as closely as possible. Simulation technologies work to achieve this goal (Radine, 1977; Seidel & Chatelier, 1997).

Simulation technologies offer substantial benefits to the military because they save the military money and provide training scenarios that would be otherwise too risky to practice. Executing battle simulations in live training are costly. They require vehicles, aircraft, equipment, ammunition, etc., and repairs to any damage afterwards (Burke, 2004; Radine, 1977). Simulations, however, avoid this cost through computer technology that replicates battle situations on a screen (Knerr, 2006; Psotka, 1995). Flight simulators are an especially effective example of this. Without needing to fly aircraft, money is saved on fuel, aircraft repairs, ammunition, and more. They also allow pilots to practice complex and dangerous maneuvers that would never be feasible in traditional aircraft training (M. Boot, 2006; Coker, 2002). Video games and virtual reality (VR), the two most-used types of simulations used to train infantry soldiers (AUSA, 2011; Prensky, 2001; Psotka, 1995), also avoid the costs of extensive field practice.

Simulations are the most effective when they can present a variety of real situations and involve the most variables (Radine, 1977). High-tech computers currently create the most modern, effective simulations because they capitalize on these factors (Radine, 1977). The technology produced by the Information Age adds complexity and realism to simulation opportunities.

Simulation technologies have grown rapidly since the commitment by the U.S. Army to focus on simulation as “the primary training tool” (Knerr, Lampton,
Singer, Witmer, & Goldberg, 1998). The introduction of computers and laser systems allowed more individualized feedback and reflection, while also making possible more effective group simulations (Seidel & Chatelier, 1997). The Army went through a few different simulators as technology progressed and reality was more successfully recreated, utilizing simulations that offer everything from training tank gunnery skills to running collective combat scenarios (Seidel & Chatelier, 1997).

Most recently, the introduction of virtual reality into the world of computer technology has rapidly advanced the capabilities of combat simulators (Knerr, 2006). Simulations operate on the ‘reality-virtuality’ continuum, with some as augmented reality, others augmented ‘virtuality,’ and the most sophisticated full virtual reality (Gutiérrez Alonso, Vexo, & Thalmann, 2008).

The simulation technology used in virtual reality uses computers to create a three-dimensional, immersive experience that incorporates visual, auditory, and tactile stimuli (Gutiérrez Alonso et al., 2008; Hoffmann, 1998). Head-mounted displays (HMDs) or stereoscopic glasses and a tracking system that includes data gloves (which track hand movements) allow the soldier to navigate through and interact with the virtual reality (Gutiérrez Alonso et al., 2008).

The Dismounted Soldier Training System is the most sophisticated VR system currently used by the U.S. Army to train its infantry troops. Figure 1 shows soldiers equipped with virtual reality technology, including HMDs and the tracking system. The gun’s laser allows the system to accurately pinpoint when and where the soldier shot within the virtual reality. Studies exploring the effectiveness of this training are still underway, but current findings express more success than failure when
evaluating the training’s efficiency and effectiveness (Armstrong et al., 2013; Knerr, 2006; Psotka, 1995). While virtual reality systems are costly, the future points to less expensive equipment (Knerr, 2006).

Figure 1 [http://www.army.mil/article/97582/Virtual_training_puts_the__real__in_realistic_environment/](http://www.army.mil/article/97582/Virtual_training_puts_the__real__in_realistic_environment/)

Video and computer games are now widely used by the military as tactical training and for maintaining training during down time while deployed (Roman & Brown, 2008). Studies of cognitive performance indicate that video game use can hone skills and responses in certain cognitive tasks (W. R. Boot, Kramer, Simons, Fabiani, & Gratton, 2008; Joseph R. Keebler, Florian Jentsch, & David Schuster, 2014; J. R. Keebler, F. Jentsch, & D. Schuster, 2014). However, the common understanding in the military that video games are effective for training is largely based on assumptions rather than published research (Roman & Brown, 2008).

Collectively, research related to simulations seeks to understand the effectiveness of simulation technology and ways to work out the observed kinks.
However, it does not theorize or study ways that simulations could psychologically affect the way soldiers interact with combat exposure—the time period their training specifically prepares them for—especially with regard to their mental health. This is the focus of Chapter Three.

**Technology During Warfare**

The technology used within warfare is varied and expansive. Collectively, however, it has helped change the face of modern warfare, not only expanding the distance between soldier and target, but also changing the type of battle and structure of combat experienced by the soldier. These technologies can be categorized in four different groups: Weapons, vehicles/aircraft, and communications and computer technologies. These three are not mutually exclusive, that is, a functional end product may utilize all three of these categories. While the way that modern warfare has changed is well documented through studies of technology, research studying the psychological effects of this on soldiers is rare and under explored.

**Weapons.** Handheld weaponry has changed very little, as is common of infantry equipment. However, the computer technology associated with these weapons has progressed, helping with sightlines and night vision (Grossman, 2009). Missiles have become smarter and more accurate through information technology. Specifically, Global Positioning Devices (GPS) have enabled the most efficient guiding system created to date, unaffected by previous negative factors like weather conditions (O'Hanlon, 2000). Firepower capabilities have also increased, which is especially noticeable through tank design and power. Tank design in the U.S. Military advanced rapidly after the Second World War to create the M1 Abrams. This tank is
formidable, almost impenetrable with firepower deadlier than any other tank in existence (M. Boot, 2006). However, these tanks are not very mobile (M. Boot, 2006), a serious consideration given that recent wars hinge on mobility and flexibility (Norwitz, 2008).

**Aircraft.** While the functional flight design of aircraft technologies has changed little since the Industrial Revolution, specific plane designs have expanded the breadth of aircraft technology. Stealth technologies, for example, have increased rapidly to create planes virtually undetectable by standard radar methods (M. Boot, 2006). Associated devices and accessories through information technology have also made aircraft more potent through accuracy and response speed, and weapons technology has made aircraft more powerful (Singer, 2009). Unmanned Aerial Vehicles (UAVs) are the most notable development in aircraft technology. They are used for a variety of purposes, including surveillance and drone attacks (Strawser, 2013). UAVs can be operated from a significant distance, such as from a base in the United States directing a UAV flying over the Middle East (M. Boot, 2006; Valavanis, 2008).

**Computer/Communications Technology.** While much of this has already been mentioned, the Information Age brought with it more ways to know more, and know more quickly, than has ever been possible before. This can be seen through satellite technology, which has now brought with it GPS, a system not only utilized by the civilian world but also relied upon by the military (Bajaj, Ranaweera, & Agrawal, 2002). This is irreplaceable for navigation and targeting (M. Boot, 2006). Night vision is another important asset. Previously, when night settled, so did
warfare. Neither side could effectively operate without light, and using lights at night gave away positions, so nighttime was a break from combat (at least for troops on the ground—aircraft still dropped bombs) (Grossman, 2009). Now, however, those with night-vision capabilities “own the night” (M. Boot, 2006). This has culminated not only in night-vision goggles for infantry troops, but also night-vision capabilities for tanks. Thermal vision is another example of this superior sight technology. Tanks and aircraft now see the heat signatures of people and equipment, making attempts to hide, a key in guerilla tactics, much more difficult (Harrison, 1977). Other devices include computer technologies, such as videoconference and improved telecommunications capabilities, that effectively shrink the battlefield, removing distance as an obstacle for many operations (Grossman, 2009).

These technologies are an integral part of the structure of wartime strategy, and are a part of the larger picture of technology in modern warfare that both directly and indirectly change the face of war. Technology is a significant enabler in war strategies, meaning that new types of action in war are now possible that were not before the Information Age (M. Boot, 2006). States such as the United States have continually increased technological productivity in terms of both quality and quantity, using the vast resources of corporate and governmental institutions to spend more on technological development than any other state in the world (Walker, 2014). At the same time, globalization through technology has shrunk the world, giving access to actors that previously held little power in terms of war or violent action. This access is both virtual and physical: virtually through the Internet and physically through easier possession of weapons and related technologies.
The goals of technology in war broadly work to increase accuracy, power, and overall effectiveness in war. Historically, the predicted need for different technological products was largely geared toward fighting the most recent previous wars, meaning state versus state with traditional, similar tactics and power on both sides—or symmetrical warfare (Glasser, 2011; Matthews, 2013). For conflicts such as the Vietnam War and the wars in Iraq and Afghanistan, this meant that even though the United States was prepared with the most powerful weapons, aircraft, tanks, and other technologies in the world, it was prepared to fight a symmetrical enemy.

However, the majority of the recent conflicts have been against opponents that utilized asymmetric strategies including guerilla tactics (M. Boot, 2006). The combatants the U.S. military faces are less powerful actors who have needed to develop different war tactics because they did not have enough power, technology, or training to successfully fight such a powerful enemy in the traditional way (M. Boot, 2006; Coleman, 2006). The Vietnam War epitomizes this track (Coleman, 2006). While the United States was prepared to fight a symmetric war on a traditional battlefield, the military had not prepared its soldiers or its equipment for this unconventional warfare (Coleman, 2006).

Efficiency of organized action has also increased with the implementation of communication technology of the Information Age. This has contributed to what is termed the ‘systems approach’ to weaponry, which allows complex operations to function as a quicker, more advanced machine with more rapid decision-making processes. The systems approach relies on a collective structure; the larger action is broken down into a series of smaller actions and actors that all compete a task within
the larger structure (Radine, 1977). This has existed since the incorporation of the assembly line into industrial productivity, but applied to military operations, it has since expanded in scope and speed (M. Boot, 2006). Weapons systems, for example, use the network of aircraft, communications technology, and personnel to find, approve, and fire at the target. While as recently as the Kosovo War, weapons systems could take as long as three days, it now can take only minutes to relay information and approval (M. Boot, 2006).

Throughout the integration of new weapons, aircraft, and communications technologies in modern warfare and the increase speed in weapons systems, the distance between soldiers and targets is constantly manipulated, as is the experience of combat. Chapter Four discusses these experiences through psychological theories of cognition, appraisal, and trauma.

**Part Two: Psychology, Trauma, and Soldiers**

This section discusses the history of psychological research and the military, psychological research and soldiers, and trauma research specific to soldiers.

**Psychological Research and the Military**

The military’s consideration and application of psychology has changed over the past century. Historically dismissive, the military is now reliant on psychological science for a variety of purposes. Overall, these applications support improving the efficiency of soldiers, tactics, and war efforts. Little psychological science used by the military solely works to support soldiers’ long-term mental health.

Psychology and the military have a messy history. This understatement alludes to programs like improving torture techniques, using psychological warfare
not only against soldiers but against larger civilian populations, screening recruits to find those naturally better at killing, and other inhumane tactics (Watson, 1978). This darker part of military history is represented in literature and film that take creative license on plausible and comparable situations. The Bourne Trilogy, originally popular novels made into critically acclaimed films, epitomize the ways psychological science can be used to formulate highly efficient soldiers in ways that minimize the “constraints” of normal humanity. Jason Bourne, a soldier that no longer remembers his past after severe head trauma, works to discover his history, and finds out that he was part of a military experiment that conditioned him to lack empathy and gave him superior abilities to kill (Ludlum, 1990). While this particular story is fiction, this application of psychological science that manipulates and harms people for the purpose of furthering military ends has historical precedence (Watson, 1978).

Psychological science is also used to promote soldiers’ effectiveness in less controversial ways. Psychological screenings and tests for entrance to the military began earlier in the twentieth century, and have been continually revised and restructured since (Peterson, Park, & Castro, 2011). These allow the military to acquire recruits that are not only physically able to handle the difficulty of deployment and combat, but are also psychologically stable, theoretically meaning that they would be less likely to develop pathological responses to combat and be more stable throughout the process (Shephard, 2000). However, systematic studies of

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2 These are also not without controversy, however. Many critics argue that tests like intelligence tests have allowed the military to make sure that those more intelligent, and deemed more important to survive, are placed in military jobs far from combat.
veterans show that individual characteristics noted before trauma are much less likely
to be predictive factors for developing trauma than are other factors completely
separate from personality traits (these factors are discussed more thoroughly in the
section on trauma research later in this chapter) (Brewin, Andrews, & Valentine,
2000). Ultimately, these screenings give the military more able-bodied and originally
healthy soldiers, which make more efficient soldiers, but have very little effect in
preventing soldiers from being psychologically harmed by war.

Methods of training are also informed by psychological science. Training now
utilizes behavioral conditioning techniques as well as group-building exercises.
Psychological studies show that drilling bodies in specific ways (through operant
conditioning) increases the soldiers’ abilities to perform in combat more effectively
(Radine, 1977). Increasing group cohesion and building a strong ingroup also work to
perpetuate certain psychological defenses and mindsets later in combat, which make
it easier for soldiers to shoot and kill (Grossman, 2009). Studies indicate that rather
than fighting for an ideology, soldiers are actually fighting to protect their units
(Stouffer, 1949; Wong, Kolditz, Millen, & Potter, 2003). Therefore, building ties
within groups during training helps to keep soldiers motivated through battle, no
matter whether they can ideologically justify their actions. Building relations within
the group also increases ingroup bias, a psychological phenomenon that creates an
“us” and a “them,” with them meaning less to the ingroup, even to a dehumanized
extent (Grossman, 2009; Leyens et al., 2000). This makes it easier for soldiers during
war to see the enemy as less than human, and so makes it easier to justify that killing
the enemy is not the same as killing another human. These processes utilize
psychological research in social psychology and cognitive psychology to produce soldiers who are more capable of following their orders effectively and are less likely to participate in dissent (Dyer, 1985; Grossman, 2009; Jack, Dawson, & Norr, 2013; Radine, 1977; Watson, 1978).

In many ways, these training now incorporate more effective preparedness training for the psychological stresses of combat. They also contribute to greater in-group cohesion and build trust and trust in competency among individuals and units, a strong protective factor in preventing psychological breakdown during combat (Griffith, 2002; Solomon, Mikulincer, & Hobfoll, 1986; Wong et al., 2003).

**Mental Illness, the Military, and the Veterans Association**

This emphasis of efficiency in the military is complemented by stigmatization of mental illness. While psychological validation of mental illnesses—in the form of the published DSM—and a growing public understanding of the extent and normalcy of pathological reactions to combat trauma have theoretically improved conditions for soldiers to report their symptoms with less judgment, this is not entirely the case. Studies indicate that soldiers fear judgment from others, especially from their military counterparts, in reporting symptoms. One study of soldiers found that those with PTSD symptoms were more likely to report feeling uncomfortable discussing their illness because of fear of social rejection than those without PTSD symptoms (Hipes, Lucas, & Kleykamp, 2014). Soldiers can also face repercussions in their professional lives when they report traumatic stress symptoms, or symptoms related to anxiety disorders (Jones et al., 1995). *War Psychiatry* (1995), a textbook written by military psychological experts, discusses the phenomenon of evacuated psychological
casualties that are then unable to return to combat because of logistical transportation difficulties. These soldiers, despite being deemed ready to return to combat, are prevented from doing so through no fault of their own. However, they are shunned by their units and blamed for their desertion. Rather than recognition that their psychological injuries were legitimate, they are judged and suffer severe consequences to their reputations within the military (Jones et al., 1995). Examples like this further the understanding that while the military may be taking strides to de-stigmatize mental illness, they are not yet enough, and they contribute to the perception that the effective functioning of soldiers is more valued and important than the pursuit of psychological wellbeing.

Patterns in diagnoses made during and after combat also reflect either ignorance, lack of attention, or willful deception by military personnel. The military is responsible for taking care of veterans’ medical needs stemming from military service. Because of this, the military has recently seen a massive leap in expenses through the Veterans Association (VA). *The Three Trillion Dollar War* (2008) discusses these originally unexpected costs, showing the inadequacy of treatment during combat, and the growing financial necessity of post-combat care (Stiglitz & Bilmes, 2008). However, the military is not responsible for financially assisting and psychologically treating those diagnosed with disorders that are not caused by military service (Cohn & Gilberd, 2009). The most striking example of this is the diagnosis of borderline personality disorder (BPD) in deployed soldiers and veterans. BPD and PTSD share similar symptomologies (Association, 2013). While not an exhaustive list, these include dissociative symptoms, suicidal thoughts, self harm,
irritability/anger, and difficulty with interpersonal relationships (Jakupcak et al., 2007). Diagnoses of BPD waive the military’s financial responsibility, but it also leaves many soldiers misdiagnosed and without necessary treatment, as was often discovered when these soldiers were later diagnosed with PTSD rather than BPD (Cohn & Gilberd, 2009). The enormity of this problem led to congressional action. Now, when a soldier is listed as serving in an ‘imminent danger’ zone and is diagnosed with a personality disorder, a second opinion is required before the soldier can be discharged (Cohn & Gilberd, 2009).

The Veterans Association fairly consistently faces criticism for various reasons that mostly boil down to their lack of funding (Klimas, 2015). However, they are also implicated in continuing to stigmatize mental illness on an institutional level, regardless of individuals’ work to rectify this image (Cohn & Gilberd, 2009). This is another example of ways the military emphasizes military efficiency over the efficacy of psychological treatment. The VA is underfunded, causing locations to be understaffed for the number of veterans that need care (Priest & Hull, 2007). This creates long waitlists for treatment (Cohn & Gilberd, 2009), which is dangerous for veterans struggling with severe mental illness, many of whom suffer suicidal ideations or develop substance use disorders in an attempt to cope on their own (Held, Owens, Schumm, Chard, & Hansel, 2011; Ouimette et al., 2005).

There is continual tension between an emphasis on military efficiency and recognition that the psychological health of soldiers is important. If this is not a vital concern in itself to the big picture of the military (as historical trends indicate), it is at least important to minimize the exorbitant costs of treating soldiers post combat. This
struggle is an ever-present trend in military operations, as the military works to create efficient soldiers but continuously encounters the human problems of psychological breakdown. One step toward synthesizing the military’s emphasis on effectiveness and incorporating ways to keep soldiers mentally healthy is the Comprehensive Soldier Fitness (CSF) program (Cornum, Matthews, & Seligman, 2011), (Peterson et al., 2011). This program seeks to prepare soldiers not only physically, but also mentally to increase resilience to combat trauma (Brown, 2014). So far there is little evidence to support its effectiveness, and posttraumatic stress rates are still rising (Cohn & Gilberd, 2009).

**Psychological Research and Soldiers**

Empirical studies assessing aspects of soldier lives (such as group behavior, integration post combat, social support, etc.) have a strong base in psychological research. However, they have specific focuses that limit the scope of conclusions and the breadth of research. Part of this is because of the limitations associated with studying soldiers. It is impossible to replicate certain situations in experimental settings, such as what it feels like to kill, because of obvious ethical implications. Determining cause and effect for many behaviors and reactions among soldiers is complicated by this, meaning that most research involving soldiers relies on correlational conclusions that have predictive value, but no assumption of cause and effect.

This said, studies of soldiers have become more common since the field of psychology was more strongly accepted by the military (Watson, 1978). Stouffer (1949) conducted the first intensive social psychological analysis of soldiers during
the Second World War. Previous to this series of studies, most psychological studies dealt with soldiers solely prior to combat or post combat; this study was novel for its presence in combat (Stouffer, 1949), and was also the largest and most comprehensive set of applied social psychological findings at the time (Psychology, 1949). Empirical studies of soldiers mostly study injuries—including both physical and psychological injuries, group behavior and cohesion, and personality factors, and how all of these affect a soldier’s ability to be an effective soldier and remain mentally healthy (Brewin et al., 2000; Clapp & Beck, 2009; Griffith, 2002; Melamed & Cubic, 2011). They seek to find the strongest predictive factors, so that disorders like posttraumatic stress disorder can be prevented and treated (Brewin et al., 2000). The following two chapters present hypotheses that expand and nuance the understanding of risk factors as they relate to technology. The next section explores trauma research more thoroughly.

Other publications related to soldiers and psychology are closer to pop psychology than empirical research. They draw on theory and evidence, but are written for the general public by psychologists, veterans, family members of veterans, etc. to fill a knowledge gap. These seek to prepare recruits for their future experiences in combat (Marlantes, 2011), educate families, current military members, and interested others about the trials of combat (Glasser, 2011; Grossman, 2009), and discuss issues long ignored by academia and the military (Coleman, 2006; Sherman, 2010). An important example of this is On Killing (2009). This book, written by Dave Grossman, a veteran and writer specializing in ‘killology,’ or the psychology of killing, discusses psychological concepts related to killing. Notably, how distance,
dehumanization, and social psychology of group behavior make killing easier or more likely in combat and desensitize an inherent aversion to killing. While referencing some studies and theories, and overall articulating theories that agree with common sense, Grossman often makes bold claims without providing sources, positing theories without substantial evidence. However, he is often referenced by experts in other fields as an expert in his field (‘killology’), which is a field lacking in empirical studies (due largely to difficulty of acquiring usable data and the impossibility of setting up experimental settings).

Trauma Research

Representations of trauma in literature and psychology have a long history. In recent history, psychological trauma research stems from Freud and Janet, who documented trauma through hysteria, dissociation, and somatoform disorders (Glasser, 2011; Herman, 1997). These precursors to modern-day trauma research underline the prevalence of pathological reactions to trauma, a current area of ongoing research by empirical psychological studies (Herman, 1997). These findings flesh out the current psychological understanding of combat trauma, from which the rest of this thesis will draw.

While psychological mechanisms other than pathological reactions to trauma are plausibly affected by technological implementation, the overwhelming psychological difficulty soldiers face is dealing with trauma (Cohn & Gilberd, 2009). This thesis is therefore concerned with the ways technological advancements interact with and affect traumatic reactions. Avenues of research proposed through this pairing promise the largest possible long-term benefit to soldiers.
The prevalence of posttraumatic stress is evident through a number of studies and statistics. Pathological or simply adverse reactions to trauma are the single most problematic aspect (psychologically) of what soldiers deal with when they return from war (Glasser, 2011) with the rate of posttraumatic stress disorder diagnoses increasing especially in the last ten years (Cohn & Gilberd, 2009). While PTSD is labeled the largest psychological disability for veterans (Marmar & Center, 1997), this diagnosis excludes those suffering from a variety of symptoms that only qualify as partial posttraumatic stress rather than the full diagnosis. This sub-threshold posttraumatic stress can still be significantly debilitating, and has been associated with suicidal ideation and greater comorbidity (R. D. Marshall et al., 2001). Posttraumatic reactions can also manifest as substance use, depressive, and anxiety disorders (DiMauro, Carter, Folk, & Kashdan, 2014). Therefore, while this thesis emphasizes research of posttraumatic stress disorder and studies of trauma in combat veterans, this is with the understanding that exposure to trauma has broad and varied consequences that are not confined to the posttraumatic stress disorder diagnosis (Shephard, 2000). The incidents of diagnosis are also not representative of the actual number of soldiers suffering from trauma-related disorders (Glasser, 2011).

In fact, developing posttraumatic stress disorder in response to trauma is not expected, though it is also not uncommon. However, the vast majority of soldiers report experiencing some symptoms of posttraumatic stress even if they do not qualify for the full diagnosis (Adler, Vaitkus, & Martin, 1996). Additionally, posttraumatic stress disorder is often comorbid with other disorders such as substance use disorder, depression, and anxiety disorders (Kozarić-Kovačić & Borovečki, 2005;
Thomas et al., 2010). These can also manifest without the additional diagnosis of posttraumatic stress disorder, and often posttraumatic stress disorder remains undiagnosed in cases of substance use disorder (Ouimette et al., 2005).

Perceptions of combat include the assumption that the situation is traumatic. This is largely based on the operational definition of trauma as posed by the Diagnostic and Statistical Manual of Mental Disorders (DSM), which defines trauma as an event that threatens life or serious harm, or a witnessed event that threatens life or serious harm of others (Herman, 1997). While whether something is perceived as traumatic is a subjective experience (Weathers & Keane, 2007), most combat carries with it the threat of death or serious harm (Herman, 1997). Studies of posttraumatic stress disorder rates also indicate that the more combat exposure, the higher the rates of PTSD (Beckham et al., 1998; Boasso, Steenkamp, Nash, Larson, & Litz, 2015; Boscarino, 1996). The consistency with which this appears in psychological literature emphasizes the interconnectedness of combat and trauma.

This definition, however, does not specify from where the threat originates. In many cases, there is very little threat to the life of the soldier, or no threat at all. However, they can still participate in or witness combat. Important examples of this are pilots and unmanned aerial vehicle (UAV) operators. Pilots now face a very low mortality rate. This is in contrast to historical mortality rates, which were often even higher than infantry mortality rates (M. Boot, 2006). With the nature of combat now, however, planes are rarely shot down, and so participating in combat is a lower risk operation. Because UAV operators manage their crafts from a significant distance away from combat, they face no risk to their life and will sustain no combat injuries.
even if the aircraft is shot down. However, pilots and operators still witness the aftermath of their actions, meaning that they still witness a threatened death or serious harm, even if they are the ones causing it. In trauma research, this is categorized under perpetrator trauma, where, in this case, the soldiers causing harm are also experiencing the trauma of acting in a harmful way (R. M. MacNair, 2002). Perpetrator trauma is considered more in-depth in Chapter Four.

A high percentage of veteran suicides is also indicative of the level of suffering post-combat for many soldiers. Given the severity of mental illness in many soldiers combined with comorbidity, stigmatization of mental illness, and often inadequate care for veterans, this is unsurprising. Flashy news coverage has claimed that the number of veterans who died by suicide exceeded the number killed in combat in Iraq throughout 2007 (Cohn & Gilberd, 2009). While controversy over what the statistics of veteran suicides mean for determining trends, suicide rates among veterans is an undeniable problem (R. D. Marshall et al., 2001).

**Diagnostic criteria, Risk factors, and Protective factors:** There are 636,120 combinations of symptoms with which to be diagnosed with posttraumatic stress disorder based on the criteria of DSM-V (Galatzer-Levy & Bryant, 2013). This emphasizes the multifaceted way with which posttraumatic stress disorder can manifest. The full diagnostic criteria are in Appendix A, but there are four main categories that need to be filled for a diagnosis of posttraumatic stress disorder. The first is that trauma occurred. With soldiers, this is usually combat trauma. The next three criteria cover three categories of symptoms: re-experiencing (such as intrusive memories or nightmares), avoidance (any attempts to avoid triggering situations or
events, such as avoiding sleep or social situations), and arousal (such as sleep disturbances, an exaggerated startle response, and irritability) (Association, 2013). If these symptoms persist longer than one month and functionally impair the soldier, then the diagnosis of PTSD is given.

The high rate of posttraumatic stress disorder among veterans has prompted studies, and subsequent meta-analyses, to determine the risk and protective factors for developing posttraumatic stress disorder, as well as associated symptomology not necessarily included in the diagnosis.

**Risk Factors**

The type and duration of trauma exposure is an important risk factor. Combat exposure is the most consistently recorded risk factor for developing posttraumatic symptoms. The more combat exposure, the higher the percentage of soldiers fulfilling diagnostic criteria for PTSD (Herman, 1997; Koenen, Stellman, Stellman, & Sommer Jr, 2003). Perpetrating trauma is also hypothesized to be a significant risk factor for developing adverse reactions to trauma. This is seen through studies of atrocities (R. M. MacNair, 2002), and also through studies of guilt, discussed below.

Another consistent finding is whether the soldier experienced dissociation. Peritraumatic dissociation—experiencing dissociation during the traumatic event, such as an altered sense of time or out-of-body experiences—is significantly correlated with developing posttraumatic stress disorder (Marmar et al., 1994). Studies of risk factors for experiencing peritraumatic dissociation, however, indicate that the tendency to dissociate during trauma could be due to other factors that are also strongly correlated with developing posttraumatic stress disorder, meaning that
peritraumatic dissociation, while a risk factor, is not a causal factor. These include “younger age; higher levels of exposure during critical incident; greater subjective perceived threat at the time of critical incident; greater external locus of control; and greater use of escape/avoidance and emotional self-control coping” (Marmar & Center, 1997), 2). These risk factors for peritraumatic dissociation are also risk factors independently correlated with developing posttraumatic stress symptoms (Brewin et al., 2000). The web of interconnected risk factors does not invalidate peritraumatic dissociation as a risk factor, but rather emphasizes the importance of considering peritraumatic dissociation in relation to other factors as well.

Guilt: Risk Factor or Symptom?

There is substantial evidence that guilt plays a role in posttraumatic stress disorder. Studies find that most combat-exposed veterans experience guilt related to their combat experiences, but that this guilt is multi-faceted with source heterogeneity (Henning & Frueh, 1997). A recent study of veterans found that combat-related guilt was more strongly felt by those experiencing suicidal ideation than those without suicidal ideation, suggesting that the role of guilt is associated with severe symptoms (Kopacz, McCarten, Vance, & Connery, 2015). Studies also indicate that guilt can potentially increase avoidant coping, which is associated with posttraumatic stress disorder. Common manifestations of guilt are guilt for surviving when others did not, guilt for killing or causing harm, and guilt for losing those they fought beside (Kubany et al., 1995). Guilt severity is theorized to be an interaction of six different factors: a negative event, distress, perceptions of responsibility, lack of justification, wrongdoing, and false beliefs about pre-outcome knowledge (Kubany et al., 1995).
Strong findings support the hypothesis that guilt is a risk factor for posttraumatic stress symptoms. Its severity is positively correlated with re-experiencing and avoidance symptoms and with overall posttraumatic stress severity (Henning & Frueh, 1997), suggesting that its presence could increase the experience of these symptoms. Theoretical considerations suggest that guilt arises after combat when a soldier cannot integrate their actions into their preexisting moral framework, meaning that they cannot justify their actions. This, then, increases combat-related distress, itself indicative of posttraumatic stress and potentially harmful coping strategies (Held et al., 2011). Street, Gibson, and Holohan (2005) found that trauma-related guilt was highly correlated with disengagement coping strategies (such as denial or distraction) that were then indicative of severe PTSD symptomatology. Held et al. (2011) replicated this study with combat veterans, finding that disengagement coping strategies partially mediated the relationship between combat-related guilt and posttraumatic stress severity. These studies flesh out the conceptualization by Kubany and Manke (1995) “that guilt-related cognitions prohibit an individual from successfully integrating traumatic experiences with prior beliefs because the trauma-related emotions are too painful, and suggest that the failure to integrate cognitions about the trauma into one’s belief system may increase the use of disengagement coping strategies” (Held et al., 2011). Disengagement coping strategies involve avoidance through alcohol or drugs, for example, or other forms of distraction. Guilt, in these cases, is a risk factor for developing harmful means of coping and pathological reactions to trauma.
Guilt is especially relevant for perpetrator trauma, an important theme in Chapter Four. However, manifestations of guilt are entirely subjective, and guilt over inaction can be just as detrimental to a soldier as firing at the enemy or a civilian (Kubany et al., 1995).

**Protective Factors**

Trust, perceptions of control, and a social support network are the strongest protective factors for remaining resilient to combat trauma (Herman, 1997). As will be discussed more in Chapter Three, perceiving control during and after trauma is correlated with lower rates of posttraumatic stress disorder (Koenen et al., 2003). For soldiers specifically, trust in the self, in those in their units, in the military institution, and in the system once they arrive home are all protective factors for reacting adversely to trauma (Herman, 1997). Social support is consistently important for developing healthy behaviors, reactions, coping methods, and relationships, all of which protect against developing posttraumatic stress disorder (Herman, 1997).

These risk and protective factors continually surface throughout the following chapters, and are important for understanding the complexity of posttrauma development.

**Conclusion**

This chapter reviewed the history and relevant literature of technological advancements in the military, psychological science used by the military, and trauma studies. The reviews of technologies used before and during warfare provide the foundation from which specific technologies are explored in Chapters Three and Four. The discussion of combat trauma, specifically the discussion of the known risk
factors, will be referred to frequently in Chapters Three and Four to develop hypotheses about technology and risk factors for posttraumatic stress reactions.
Chapter Three: Simulations Technology, Perceptions of Control, and Perceptions of Reality

As discussed in Chapters One and Two, the psychological effects of simulation technology on the experience of and reaction to combat trauma has been largely omitted from psychological studies. Simulation technology, the newest and most widely used form of technology used during training, encompasses video games, virtual reality, flight simulators, and other specific computers technology. This chapter highlights aspects of simulation technology that manipulate psychological mechanisms important for supporting risk or protective factors for developing posttraumatic stress symptoms. Specifically, the chapter explores perceptions of control and perceptions of reality through three different concentrations of psychological research. These sections are divided based on the primary psychological theories involved. The first discusses theories of perceiving control; the second discusses theories of behavioral conditioning; and the third discusses theories of perceiving reality. After discussing the relevant literature available, each section lays out hypotheses and proposals for further research seeking to understand whether simulation technology, through these psychological mechanisms, presents a risk for or aids in protection against developing posttraumatic stress symptoms.

Simulation Technology

Modern training technologies focus on the simulation of reality with the intent to prepare soldiers for combat more effectively and make more cohesive, functional units. Primarily, these technologies are virtual reality (VR), video “games,” and more
specified simulators such as flight simulators. Existing human factors (ergonomics) research gathered by the military on these technologies is concerned with determining how effectively they achieve their training goals, and if they are worth the money, especially in the case of VR. Given that these simulators work to achieve certain training goals, these studies are only seeking to understand whether they are effective in producing their primary function. Studies examining if there are unintended consequences unrelated to this proper functioning are virtually nonexistent. For example, simulator sickness (a form of motion sickness) has been noted as a major problem for many soldiers operating VR systems (Regan, 1997; Stanney, 1995). Regan (1997) observes simulator sickness as a side effect of VR technology on the user. However, this is with the intent of eliminating this unintended consequence so that the VR system can continue uninhibited. This does not explore the psychological ways that VR could unintentionally affect future ways soldiers interact with combat trauma.

To this end, certain aspects of simulators are particularly relevant to psychological theories of trauma. One of the main goals of simulation training is to increase soldiers’ skills and competency while deployed and in combat. This involves a variety of simulations, including marksmanship training, that rely on drill, but present more realistic targets through computer animation (AUSA, 2011). This also includes discrimination training (AUSA, 2011; Scribner & Harper, 2001). These types of drills condition behavior and hone skill through repetition (Knerr et al., 1998). It also involves familiarizing soldiers with the terrain they will be facing, an invaluable way to prepare soldiers for their day-to-day operations and navigational
needs (Knerr et al., 1998). More sophisticated simulators also allow group trainings that allow soldiers to participate in VR and less immersive simulators with their units (Seidel & Chatelier, 1997). This increases trust and effectiveness in the unit, theoretically making operations run more smoothly when in actual combat (Grossman, 2009). While the overall effectiveness of simulation training (especially newer simulators like VR) is still being researched (Seidel & Chatelier, 1997), soldiers report that they feel more competent with this training. A common sentiment is that they feel safer and more able to handle their deployment because they know they have the skills to handle a variety of situations, even if they never have to face them (Grossman, 2009).

Simulations also attempt to mimic reality as closely as possible. The process of simulating reality involves analysis of which aspects of reality are not only possible to create given current technology, but also which are the most important to incorporate (Gutiérrez Alonso et al., 2008). Whether to create fear and anxiety, for example, is a constant source of debate. Some experts suggest that soldiers will never feel the same level of fear or anxiety in a simulation that they will in combat no matter the quality of the simulation, so it does not help to spend resources trying to create it (Burnett, 2011). These proponents argue that instead, they should construct situations to train soldiers how to react to those situations behaviorally rather than teach them how they will respond emotionally, because this gives them the tools to be effective in combat (Malo, Stapleton, & Hughes, 2004). With that said, simulation designers also make sure that soldiers experience “simulation death”—meaning that they are killed in simulated combat—so that they take the simulation as seriously as
possible (Seidel & Chatelier, 1997). The “reality” created by VR, video games, and other simulators, however, is never confused with real life; that is, it is not nearly as realistic as designers hope to make it in the future (Malo et al., 2004). Virtual Reality simulators focus on visual and auditory stimuli, though haptic (touch) capabilities are under development and available in some versions of VR (Gutiérrez Alonso et al., 2008). Taste and smell are also under development, but they are far from realistic (Seidel & Chatelier, 1997). These senses are important to a soldier’s sense of reality, since a commonly jarring experience reported by soldiers is the smell, sounds, and even taste of combat (Malo et al., 2004; Marlantes, 2011), the senses for which they had the least accurate preparation.

Flight simulations, historically the most advanced simulations used in training, are even said to be “hyperreal” in not only their ability to give soldiers practice with situations that could never be practiced in a real plane but also their sophisticated full-body experience with controllers physically responding in simulation the same way they would during flight (M. Boot, 2006; Coker, 2002). Even with these advancements, simulations do not fully reflect reality. Pilots trained on even the most sophisticated simulators report feeling fear for the first time when actually flying (Jones et al., 1995).

Collectively, these simulators represent the newest in training techniques. They are assumed to be the most cost-efficient and best way to create effective soldiers and units. Virtual Reality, video games, and other simulators accomplish this by imitating reality and training specific skills through behavioral conditioning.

I. Control and Trauma
This section explores psychological theories of control and their importance to trauma studies. This is followed by hypotheses discussing whether perceptions of control are cultivated through simulation training, the findings of which have significance for preparing and treating soldiers for combat trauma.

**Psychological Theories**

Across the board in psychological research of trauma, perceptions of control continue to rank as one of the most important predictive factors for development of pathological post-traumatic responses. It suggests almost conclusively that having control (in whatever way it is construed), or perceiving control even in an inaccurate way, is better than the reverse (Herman, 1997). Control can manifest in many ways, most commonly through a fostered or preexistent internal locus of control (Bolstad & Zinbarg, 1997) or through goal-oriented action (Jones et al., 1995).

Psychological studies of control support the importance of attribution of control to either external or internal factors, depending on the individual’s locus of control. Loci of control exist across a spectrum (Joe, 1971). People exhibiting external loci of control (“externals”), in contrast to exhibiting internal loci of control (internals), feel as if the universe acts upon them, and their actions are irrelevant to the events that will inevitably happen. This strips the individual of perceived agency and ability to take effective action (Hiroto, 1974; Joe, 1971). Conversely, a person with an internal locus of control does not only expect to have control over a situation, but retrospectively sees how they acted and could have acted differently to reach the originally desired outcome, implying a sense of control over the outcome even when a situation turns out poorly (Bolstad & Zinbarg, 1997; Janoff-Bulman, 1982).
However, internals also engage in greater levels of denial when they fail, or act in ways they regret (Efran, 1963). While original studies of the internal-external spectrum suggest that it is a personality trait (Hersch & Scheibe, 1967; Joe, 1971), meaning that it is fairly stable across time and situations, other studies reinforce that this is not necessarily a stable trait but is capable of change through persistent environmental factors (Hiroto, 1974). The phenomenon of learned helplessness is an example of an environmentally acquired external locus of control, in which repeated exposure to inescapable events fosters stronger tendencies toward an external locus of control (Hiroto, 1974). This reinforces that loci of control cannot be considered in a vacuum.

In trauma research, those with an internal locus of control are consistently found to fare better than those with an external locus of control. In an unexpected way, rape survivors who develop posttraumatic stress disorder are more likely to express an external locus of control than an internal locus of control (Bolstad & Zinbarg, 1997; Regehr, Cadell, & Jansen, 1999). Studies seeking to uncover personality traits associated with developing posttraumatic stress disorder find very few predictive variables. However, studies suggest that having a stronger internal locus of control is a protective factor against developing PTSD (Bolstad & Zinbarg, 1997; Janoff-Bulman, 1982). Within a sample of soldiers who faced the same combat intensity, soldiers with an external locus of control developed PTSD at a higher rate than did those with an internal locus of control (Bart & O'Brien, 1985). The available psychology literature explains that because internals can justify to themselves that the trauma was an avoidable occurrence, they will be aware of similar situations in the
future and will act in a way that will enable them to avoid the same trauma (Herman, 1997). Those with an external locus of control see what happened as inevitable, as something entirely outside of their control, and no matter what they had done, it still would have happened to them. Because of this, the future is full of “helpless victimization” (in its most extreme form) (Herman, 1997); anything could happen, and they think their actions have no ability to change future events. In the same vein, anything good that happens does not necessarily happen because they did something right. This does not mean that every person exposed to trauma with an internal locus of control does not develop post-traumatic stress symptoms and that every person with an external locus of control does develop post-traumatic stress symptoms. Rather, it gives us an important window into one of the more consistent findings in trauma literature.

Another consistent finding in psychological literature is the ability of smaller tasks to provide a way to create control even in a larger, unpredictable situation. Goal-oriented action, or simply the ability to take action that could affect the situation, constructs a better sense of control in a situation that would otherwise be too chaotic. Peacekeeping missions by United Nations soldiers provide an important example of this. These soldiers have strict rules of engagement, limiting their ability to respond to attacks or intervene. Studies of prevalence rates of PTSD and relevant factors in peacekeepers (all trained for combat as well) find that not being able to act while witnessing something upon which the combat-trained soldier would normally act creates dangerous levels of frustration (Litz, Orsillo, Friedman, Ehlich, & Batres, 1997). Without being able to exert control over the situation, the peacekeepers are
required to let what is happening unfold without their intervention. This is almost identical to what many soldiers face during mortar blasts at base camps. Reports of posttraumatic stress symptoms by soldiers who never saw combat cite the terrifying hours waiting for an attack, knowing that they would not be able to do anything about it, but expecting it nonetheless (Jones et al., 1995; Marlantes, 2011). They were fully aware they could die or be injured, or their friends could die or be injured, at any moment, but had no possible actions to take, no control to exert.

Just as these studies show the negative influence of a lack of control, other studies support the positive influence of being given control or finding some aspect of control (Jones et al., 1995; Phillips & Gully, 1997). When a soldier is a platoon leader, for example, they are responsible for the safety of those under their command, which makes them more decisive (at least outwardly), creating a clear direction and goal. Action in combat, then, becomes more narrowed to the goal of leadership and the mission, limiting the scope of action to one in which they have control, distracting from the trauma and that which is uncontrollable (Jones et al., 1995). Distracting from the full scope of combat by narrowing the focus to something the person is competent at and capable of accomplishing also builds control and correlates with lower rates of PTSD (Jones et al., 1995). For example, medics in war, while seeing plenty of gore and death, have a clear, busy goal, to care for the wounded and keep soldiers from dying. Many soldiers describe getting through combat mentally unscathed (relatively) by focusing on their job within combat, on what they were able to accomplish because it was within a smaller scope of action than the entirety of combat (Grossman, 2009). This level of control through competency and goal-oriented
attention may be strongly supported as a protective factor against developing post-traumatic stress symptoms, but like having an internal locus of control, it does not guarantee a pathology-free response to combat.

Though control is argued to be a protective factor against developing posttraumatic stress disorder, this is complicated by the risk factor of guilt. When the soldier develops guilt over actions taken or not taken, research suggests that control actually becomes a risk factor. If the person perceives that they had control to change the situation for which they feel guilty, then perceiving control no longer protects against developing post-traumatic symptoms such as re-experiencing (Owens, Steger, Whitesell, & Herrera, 2009). This is supported by studies that find that a greater internal locus of control is associated with more responsibility of actions (Efran, 1963).

**Hypotheses of Control and Simulations**

This section discusses the intersection of competency, goal-oriented action, perceptions of control, and reactions to trauma with specific reference to simulations and simulation design. Given the predictive significance of perceptions of control for developing posttraumatic stress symptoms, this future research will be informative for developing ways to better prepare soldiers for combat trauma.

**Hypothesis 1A: Simulations increase sense of competency and sense of control, meaning that simulation training is a protective factor for developing posttraumatic stress symptoms.**

This hypothesis is two-fold. Initial evidence suggests that simulations increase soldiers’ sense of competency and ability act during war, and the way this
competency manifests as a means of control suggests that simulations could foster a perception of control during combat trauma.

Because soldiers spend a significant amount of time using simulations to train skills and situation-specific courses of action, this raises soldiers’ sense of competency. While studies about whether video games are actually effective in honing specific skills are still in their infancy, studies of video games report that even if video games are not actually effective at improving soldiers’ skills, soldiers think that they work (Roman & Brown, 2008). This indicates that their confidence in their abilities increases regardless of whether their skill actually does.

Increasing perceptions of competency is a part of perceiving control, which suggests that the implementation of simulations such as video games could increase soldiers’ perceptions of control in combat. While this has yet to be substantiated by empirical research, anecdotes from soldiers imply that this could easily be the case. One soldier, quoted by Grossman (2009), discusses how even though he never used many of the skills he learned during simulations, he felt well prepared, and thus less anxious because this preparation carries with it a sense of agency and control. This is substantiated by theories of control discussed above that emphasize the power of having a goal, or something that can narrow the chaos into achievable actions that the soldier is trained for and feels competent accomplishing.

This hypothesis should be pursued through a series of psychological studies. Studies first verifying that simulations increase perceived competency by soldiers (independent of whether simulations actually improve skills), followed by studies tracking the perceived competency by soldiers pre combat and perceived competency
and control during combat could indicate how related these two variables are. Though experimental designs could not duplicate the effects of combat, controlled designs could study the effects of fostering competency through simulation training of specific skills, and whether perceptions of control increase during applied use of the trained skill for those with more perceived competency. This would provide support for the theory that perceptions of control during combat would increase with perceptions of competency.

A potential lurking variable in this situation could be cultivated trust in the military and superiors. Trusting comrades and superiors, and having confidence in their abilities, is another protective factor against developing a combat stress reaction (Herman, 1997). This could be teased apart through research that uses surveys or interviews to evaluate trust in comrades/superiors/military institution, amount of time spent on simulators, levels of competency, perceptions of control, amount of time in combat, and perceptions of control while in combat. This research would serve to distinguish effects of simulation technology and help the military foster perceptions of control through this approach if it did turn out to be fostered through simulations. This is tangentially supported by research that emphasizes how soldiers with an inflated sense of theirs and others’ abilities in their unit tend to be more stable throughout combat, with fewer incidences of acute and posttraumatic stress symptoms later in life. It suggests that even if perceptions of control are misplaced, they create a stronger mental shield for the soldier.

Hypothesis 1A explains situations where perceptions of combat aligned with previous expectations. That is, the soldier’s sense of competency and control are
protective if they experience combat in the way they expected they would, or at least felt they were trained to handle the unexpected in a way that fell within their simulation-trained skillset. Hypothesis 1B presents an explanation for combat experiences that fall outside of this range.

**Hypotheses 1B: Simulations foster a false sense of control that makes combat trauma more chaotic and devoid of control.**

An alternative consideration takes into account the dangers of shattered illusions of control. If simulations and virtual reality foster perceptions of control, this does not guarantee that it is protective factor in actual combat. If, for example, what soldiers expect from combat is drastically different from how they have been prepared, then they could perceive a loss of control even if they originally felt competent. A shattered trust in the system would exacerbate this loss, potentially making it worse than it otherwise would be perceived. Loss of control and shattered trust in the system are strong correlates not only with each other, but also with PTS symptoms (Herman, 1997) While soldiers experience loss of control, shattered trust, and other correlated risk factors because of a variety of convoluted processes, it is important to ascertain whether simulations and virtual reality do, in fact, play a statistically significant role. If this hypothesis were supported, it would be especially important for the military to redesign simulations to foster a more protective training atmosphere for soldiers rather than one that increases the likelihood of posttraumatic stress symptoms.

Hypothesis 1B presents experimental difficulty. However, surveys could be designed to question both soldiers who develop posttraumatic symptoms and those who do not, asking questions that explore the disjoint between simulation reality and
actual combat. Soldiers could then individually evaluate how important this discrepancy feels to their symptoms, or lack thereof. This study would provide initial evidence either supporting or refuting this hypothesis and would be important for directing further research.

II. Conditioning and Trauma

A significant reason simulations are effective is because they condition certain behavioral responses through repetition and reward systems. Relatively unexplored in psychological research, however, is how this conditioning could affect soldiers’ appraisal of their actions during combat, and how this affects their reactions to psychological trauma. This section addresses theories of decision-making and behavioral conditioning, and the development of procedural versus declarative memory and action are considered, and lays out a set of hypotheses about the relationship between behavioral conditioning, control, and posttraumatic reactions.

Psychological Theories of Decision Making

Theories of decision making under either duress or time constraints indicate that decisions are made based on prior decisions in similar situations, not on a conscious analysis of different possible courses of action. This is seen through the Recognition-Primed Decision (RPD) of rapid decision making, proposed by Klein (Clark, Manns, & Squire, 2002), which is based on findings of fireground commanders and other actors required to make important, rapid decisions. Klein et al. (1986) found that decisions made in these situations did not use standard models of decision making that engage in option generation, meaning that they did not consider theoretical alternatives. Rather, they made decisions based directly on prior
experience of similar situations, and did not seek to find different alternatives (G. A. Klein, Calderwood, & Clinton-Cirocco, 1986). Studies suggest that recognition-based decision making, in contrast to analytical decision making, which does take theoretical alternatives into account, is used mostly in situations where the person is experienced in the type of situation, is limited in time, and is in an unstable situation.

In more stable, less time-restrictive situations, analytical decision-making is more common.

Additionally, Natural Decision Making theory (NDM) suggests that people make decisions based on prior experience, and that this is a more formative process than considering untried abstract concepts (G. Klein, 2008). This has been applied to military training to give practical situations to soldiers, meaning that once they are in combat, their training will have prepared them to make the same decisions in response to similar situations that they made in training, and be confident that this is the best decision. This reinforces the theory of the Recognition-Primed Decision model for its application to decisions made in combat.

**Psychological Theories of Conditioning**

Theories of behavioral conditioning as emphasized in simulations have implications for posttraumatic stress. Dave Grossman, a veteran, writer, and speaker about psychological issues surrounding ‘killology,’ discusses his theories of behavioral conditioning and killing in war. He claims that stimulus-response training of realistic drills that include man-shaped targets (rather than the historical bull’s-eye) condition a soldier to shoot and kill reflexively. He claims that 75 to 80 percent of
this type of shooting on the modern battlefield is a conditioned response and that it would not happen otherwise.

This statistic is not cited, but Grossman indicates that it is his deduction from the findings of S.L.A. Marshall (discussed in Chapter Two) who reported that only about fifteen percent of soldiers were shooting at the enemy during World War II. Grossman (2009) discusses these findings in which he also mentions that once training assumed a more realistic form with human-shaped targets that pop into view (and other simulations), firing rates improved to over 95 percent during the Vietnam war. The 75-80 percent statistic suggests that Grossman took these two findings as a direct show of cause and effect, a conclusion that cannot be made given that (a) Marshall’s original findings are still controversial, and even if they are true were not based in a wholly reliable scientific method, and (b) even if his findings were accepted as entirely accurate, this direct cause-effect conclusion cannot be made because it does not account for any alternative explanations or lurking variables. Given this skepticism, Grossman’s assumptions provide a provocative avenue of theory, but in no way determine the effectiveness of behavioral conditioning to make a soldier reflexively kill in battle.

Grossman’s assertion that behavioral conditioning is responsible for a significant percentage of shooting in combat and that it could affect a soldiers’ mental state regarding firing a weapon in battle, is compelling and worthy of more research. There are psychological theories with significant research bases that suggest this hypothesis could be supported in future research. The use of behavioral conditioning
techniques is prominent in military training, the effectiveness and consequences of which are explained by theories of learning and memory.

Simulations train marksmanship through realistic drills on screen, which involve motor skills training and procedural memory conditioning. These processes are tied to a complex network of interactions within areas of semantic (conscious) and procedural (unconscious) memory. As an action or series of movements is learned, it becomes a process of procedural memory that happens with little need for conscious awareness (Eichenbaum & Cohen, 2001). In terms of simulations, this means that aiming properly and shooting become an unconscious, learned skill.

Additionally, unconscious motor processes can become reflexes through conditioning. The cerebellum and basil ganglia, areas of the brain associated with procedural and motor memory, are also associated with reflexive action, and the ability to hone a learned skill and reflex (Eichenbaum & Cohen, 2001). “The striatum and associated basal ganglia structures play a critical role in habit learning, and particularly in the acquisition of skills that require resolution of competition between multiple input or response options, particularly in tasks involving the learning of response sequences” (Eichenbaum & Cohen, 2001, 470). This is particularly relevant for military simulations that use stimulus-response training, such as marksmanship and shoot-don’t shoot models (AUSA, 2011). As previously mentioned, studies indicate that simulation skills training is effective in honing marksmanship skills (Knerr et al., 1998). Through this cognitive model and suggested effectiveness of simulation training, it is clear that training the process of aiming and firing, while also training the reflex of shooting targets that pop into the field of vision (via the
simulation screen) have the capacity to condition procedural memory through the complex circuitry involving these brain areas. This creates the complex reflex of aiming and firing. These actions are relied upon in combat.

**Hypotheses**

*Hypothesis 1C: Conditioned responses in training are a risk factor for developing posttraumatic stress reactions.*

Hypothesis 1C is broken up into three components (1Ca, 1Cb, 1Cc) below to flesh out this broader claim. This is followed by a brief discussion of the value of this specific research and implications for whether findings support or refute it.

*Hypothesis 1Ca: Soldiers engage in recognition-primed decision making.*

Recognition-Primed Decision making theory suggests that extensive training in what to do in certain combat situations would make it more likely for soldiers to engage in recognition-primed decision making not only because they are often pressed for time and in unstable situations, but also because they have experience with making those decisions during training. This hypothesis of recognition-primed decision making and soldiers in combat is currently unsubstantiated, but could be explored through a similar study to Klein et al. (1986), which gathered data through surveys of fireground commanders.

*Hypothesis 1Cb: Soldiers are more likely to fire their weapons during combat after training on simulators.*

This further suggests that soldiers would be more likely to fire their weapon, since one of the primary training simulations focuses on the stimulus-response of aiming and firing reflexively. This also suggests a psychological basis for the claim made by
Grossman discussed earlier, which says that a higher percentage of soldiers fire their weapons now because they are conditioned to shoot reflexively. A combination of the procedural memory fostered by simulation technology, and the decision making supported by recognition-primed decision making theory suggest that this has a theoretical basis, and could be tested. Since all soldiers are now trained using at least some form of simulation technology, and because details of training vary significantly between branches (Burke, 2004), it is improbable that a study could be designed tracking current soldiers. However, an experimental design could condition a group of participants to act in similar ways to soldiers using simulations, and compare how reflexive the action becomes. However, this would only have a small amount of external validity. It would require nonexperimental follow-up studies exploring how soldiers attribute their actions in combat.

**Hypothesis 1Cc: Soldiers who fire reflexively do not consciously approve their actions beforehand, and this disjoint makes soldiers feel less in control, which would be a risk factor for developing posttraumatic reactions.**

The reflexivity of actions mean that sometimes these actions happen before our declarative system has time to process conscious reasons justifying our actions. Often our brain does not recognize, “I just touched a burning stove” until we have already removed our hand, cognizant of the pain but not of the decision to move our hand. Reflexive action, in other words, gives more control to the body than to the mind. What if it has too much control, and does not give the mind enough? If the soldier feels like this reflexive action supersedes cognitive control, then this could increase
the perception of a lack of control. Applied to a more specific situation, this could happen if a soldier’s reflex was to shoot, but noticed too late something that would have made them refrain. For example, if the target turned out to be unarmed. On the one hand, soldiers feel loss of control of their own bodies. On the other hand, the soldier feels responsible for what happened, a sense that they had control over the situation, and that they made a mistake. In this situation, guilt would become a primary concern, and control a risk factor rather than a protective factor.

Another way to consider this situation is through research that discusses the departure of military training from individual morals. Much military philosophy and faith-based discussion about military service references the importance of coming to terms with a different understanding of traditional morals while at war. Many soldiers, conditioned to shoot, pumped with adrenaline, shoot without inhibition in battle, and later have a very difficult time justifying to themselves why it was so easy to kill another human being (Marlantes, 2011). Rather than losing control of their body, they feel as though they are betrayed by their body and mind. This is hard to come to terms with, which is often reflected in the anecdotes of soldiers struggling with posttraumatic stress disorder (Grossman, 2009; Sherman, 2010). There is currently no evidence, however, that feeling as if the body has more control than the mind is a determinant of posttraumatic stress disorder. This is one variable amidst many, much the same as most of these discussions. However, research exploring the difference in reactions between soldiers conditioned through the method of simulation conditioning and civilians doing a similar task may reveal if there is an effect, and how large of one, on soldiers’ “lack” of mind control.
This line of research could initially benefit from surveys of soldiers returning from combat, or even done immediately after combat. Items could ask soldiers to what degree they agree with phrases such as “I did not think before firing my weapon,” “Firing my weapon at the enemy was a reflex,” “I thought before firing my weapon and decided it was the correct course of action,” “I felt like my body had more control than my mind,” “Sometimes when I fired my weapon, it was a reflex that I regretted afterward” etc. This type of survey would give a baseline for understanding the general responses of soldiers in combat in terms of their conditioning to reflexively shoot. However, it would not be able to suggest a causal link between simulation conditioning and reflexive firing, or reflexive firing and regret. Further studies would be necessary to design ways to measure the degree to which reflexive action in war can supersede someone’s cognitive judgment, because this is imperative for determining whether this hypothesis has merit. If it does, it will be important for simulation technology to condition action in a less reflexive fashion that necessitates conscious awareness.

If future studies cannot substantiate this hypothesis, this line of inquiry will still provide scientific basis for more fully understanding the consequences of simulation technology and conditioned responses on trauma reactions. In fact, the opposite of hypothesis 1C (that instead of being a risk factor, conditioned responses through simulation could be a protective factor) could gather support from research as well, and provide support for the value of conditioned responses as a protective factor against posttraumatic symptoms.
Many soldiers discuss the idea of freezing in battle, a part of the fight-or-flight response (the full response typical of combat includes fight, flight, freeze, or posture) (Rahman, 2009). Soldiers also discuss how unexpectedly terrified they were. They mention that they had expected this but even while expecting it were not prepared for how it would numb their minds (Grossman, 2009). When this happens, the person feels helpless and completely out of control, because action feels impossible but inaction would be fatal (Grossman, 2009). Conditioning behavioral reactions is a way to jumpstart this. When the mind is struggling to grasp what is happening, the body can revert to its training and respond to commands and situational cues in ways that were trained for in simulations (Clark et al., 2002). In this way, conditioned responses through simulations benefit the soldier’s perception of control, and protect the soldier from becoming a psychological casualty.

Soldiers also discuss a ‘dazed’ condition, where they felt cognitively impaired, but because of their training they were able to continue to participate effectively in combat, allowing them to feel competent and in control. Injured soldiers also report being able to rely on their conditioned drills to not only protect themselves from further injury, but also remove themselves from a position that could compromise the unit’s mission even when they were in enormous amounts of pain and could think of nothing else. These instances promote the idea that the preparedness of the body would increase feelings of competency and control, and so contribute to a protective factor rather than a risk factor for PTS symptoms.

III. Perceptions of Reality and Trauma

Psychological Theories
While VR, video games, and other simulators do not yet replicate reality in an indistinguishable way, the emphasis on duplicating reality, and the future direction of more ‘realistic’ reality require psychological research to explore the effects on soldiers of manipulating reality. Given that simulation design focuses on the creation of reality with the assumption that this will train soldiers’ behaviors more effectively, it bears asking: are there any unintended psychological effects of this reality manipulation during training on experiencing combat trauma? Psychological theories of reality distortion during trauma indicate that this is possible.

In psychological terms, the distortion of reality is dissociation. Dissociation encompasses a broad range of experiences. It can be a symptom of mood, anxiety, and trauma-related disorders, but it can also occur independently of disorder. In fact, up to 75 percent of the general population report experiencing depersonalization or derealization (types of dissociation defined below) at least one time in their lives, when experiencing anything from fatigue, panic or stress to drug use (Hunter, Sierra, & David, 2004). Given the breadth of experiences considered as dissociative, what the term should encompass is still debated (DePrince, Chu, & Visvanathan, 2006). However, dissociating during trauma (peritraumatic dissociation) is consistently found to be a predictive factor for developing posttraumatic stress disorder. This can take the form of any of the following:

…altered time sense, with time being experienced as slowing down or rapidly accelerated; profound feelings of unreality that the event is occurring, or that the individual is the victim of the event; experiences of depersonalization; out-of-body experiences; bewilderment, confusion, and disorientation; altered pain perception; altered body image or feelings of disconnection from one’s body; tunnel vision; and other experiences reflecting immediate dissociative responses to trauma (Marmar & Center, 1997, p. 1).
Of these experiences, depersonalization and derealization are common. Studies show that between thirty and 66 percent of those who experience trauma also experience peritraumatic derealization or depersonalization (Hunter et al., 2004). Derealization and depersonalization both convey a sense of unreality. Depersonalization conveys a sense of unreality and separation from the self, and it can be accompanied by a “dream-like state, loss of empathy, and a sense of disconnection with bodily parts to the extent that the sufferers feel as though they are observing the world from behind glass” (Hunter et al., 2004, p. 9). Depersonalization can also be accompanied by derealization (though both can also operate independently), where the external environment feels unreal or may seem “unfamiliar, with other people appearing as though actors and the world appearing as if two-dimensional or like a stage set” (Hunter et al., 2004, p. 9). This disconnection, unfamiliarity, loss of empathy, and general sense of unreality are frequently referenced by soldiers in memoirs and other writings (Grossman, 2009; Marlantes, 2011), and are informative for analysis in the next section.

While studies of peritraumatic dissociation and combat soldiers are not exhaustive, they find that peritraumatic dissociation during combat is common. One study found that about thirty percent of combat soldiers experienced depersonalization or derealization as peritraumatic dissociation (Davidson, Kudler, Saunders, & Smith, 1990). Another study found that peritraumatic dissociation increases with the severity of combat exposure (Marmar, Weiss, Metzler, & Delucchi, 1996). Given that a higher percentage of soldiers are exposed to more combat than
were before (Gawande, 2004), this suggests that peritraumatic dissociation will remain a relevant issue for combat exposure.

Because of the qualitative nature of peritraumatic dissociation, a significant amount of psychological research works to create a measure of recording it reliably (G. N. Marshall, Orlando, Jaycox, Foy, & Belzberg, 2002). This scale, called the Peritraumatic Dissociative Experiences Questionnaire (or the PDEQ, which can be seen in full in Appendix B), calculates presence and severity of peritraumatic dissociation through eight different statements, scaled from one to five. The statements are:

1. I ‘blanked out’ or ‘spaced out’ or in some way felt that I was not part of what was going on.
2. Things seemed to be happening in slow motion (Very slowly)
3. What was happening didn’t seem real, like I was in a dream or watching a movie.
4. I felt like I was watching what was happening to me, like I was floating above the scene or watching it as an outsider (from the outside looking in).
5. I felt separate or disconnected from my body or like my body was unusually large or small (not normal size—too large or too small).
6. Things happened that I didn’t notice, even though I normally would have noticed them.
7. I felt confused or couldn’t make sense of what was happening.
8. There were moments when I wasn’t sure about where I was or what time it was (G. N. Marshall et al., 2002).

These statements correspond with different ways of dissociating during trauma, and catch a wide range and severity of experiences (G. N. Marshall et al., 2002). Item three corresponds most strongly with derealization and items four and six with depersonalization. The phrasing of these terms is indicative of the qualitative nature of peritraumatic dissociation, and important to consider with the often-anecdotal sources of soldiers’ experiences. In particular, it is common in memoirs, interviews,
and general anecdotes for soldiers to express the unreality of combat—that they felt like they were in a movie (item 3) (Grossman, 2009). This, as well as features of peritraumatic dissociation emphasized above, are discussed with reference to simulation technologies in the next section.

**Hypotheses Concerning Reality and Simulations**

These examples of expressed unreality imply derealization and general peritraumatic dissociation (though the actual measure would need to be administered to gauge severity), and they implicate simulations and the visual culture of working to realistically replicate violence, which is further emphasized by the video games and virtual reality used by soldiers. While the military works to make simulations feel real, these examples suggest that perhaps simulations are actually making reality feel more unreal. This connection suggests that VR, video games, and simulations could be correlated with peritraumatic dissociation.

With derealization and depersonalization already so continuously present in traumatic exposure, an interesting question is, do more soldiers experience derealization and depersonalization after being exposed to such strong “simulators” of reality as the Dismounted Soldier Training System? This question currently has no answer, and speculation could be formed to make a hypothesis either way, based on the research drawn on to make this claim. For example, perhaps it will be no different. Since soldiers experience derealization and depersonalization at such high rates anyway, perhaps exposure to virtual reality simulators simply takes what derealization and depersonalization that would have already existed and attaches it to the only other memory that the current reality resembles. Alternatively, perhaps it
creates more depersonalization and derealization because it gives the soldier so much practice imagining reality that when actually faced with reality, the false one is so present in the mind that it is more difficult to accept reality. Studies could be constructed to examine this question. Findings in this area would give more insight into whether constructing reality could contribute to the development of posttraumatic stress symptoms by creating more depersonalization and derealization in face of trauma, making it more difficult for soldiers to integrate their experiences, unable to accept and fathom that they are real, even while knowing they are.

**Hypothesis 1D: Simulation technology makes reality feels less real.**

This hypothesis is predicated on the connection with reality feeling like a game, movie, or simulator experience. Most of the concern within literature about simulation technology is whether it effectively duplicates reality, and how it can be made to further resemble reality. What is not asked, however, is whether this imitation of reality has an impact on the way reality is perceived. Based on the anecdotal experiences of soldiers that suggest reality feels like something else (move, game, etc), it suggests that this hypothesis has merit. Future research to test this hypothesis could initially focus on interviews of soldiers to establish a baseline for the way reality is described in comparison to the simulations and video games practiced, and how this affected the way they interacted with their combat reality. Depending on the findings, coupled with the findings of the hypotheses below, this line of inquiry would merit further investigation. Failing to attribute reality to real situations could have significant consequences for soldiers’ mental health, such as experiencing peritraumatic dissociation, as discussed below.
**Hypothesis 1E: Simulators increase peritraumatic dissociation.**

Based on the theories above, experience with simulation technologies such as video games and virtual reality that imitate combat situations could increase instances of peritraumatic dissociation experienced by soldiers, specifically through derealization and depersonalization. This could be explored through studies comparing the rates of peritraumatic dissociation using the PDEQ of soldiers now compared with older veterans who did not train on the newest simulation technology. A more specific questionnaire that distinguished between thinking something felt like a move, video game, virtual reality situation, etc. could more accurately pinpoint whether this difference in peritraumatic dissociation (if it is supported by research) was explicitly linked to simulator use.

**Hypothesis 1F: Simulators change the type of peritraumatic dissociation.**

Alternatively, depersonalization, derealization, and other types of peritraumatic dissociation specifically related to connecting reality to the unreality of games/simulators could change the breakdown of answers to the PDEQ. Perhaps, rather than increasing the rates of peritraumatic dissociation, the use of simulators could be increasing the likelihood of experiencing this particular type of peritraumatic dissociation. This could be pursued in future research through administering the PDEQ to returning soldiers and veterans from previous conflict to see if the breakdown of answers is qualitatively different, even if the instances of peritraumatic dissociation remain the same. For example, if item number four (“What was happening didn’t seem real, like I was in a dream or watching a movie”) was answered more frequently or more intensely by soldiers of recent conflict that trained
on simulators than by veterans of older conflicts, this would provide initial support for this hypothesis. Using the altered questionnaire suggested in the paragraph above would also flesh out this hypothesis.

**Hypothesis 1G: Simulators increase dehumanization.**

Something that is rarely accounted for in the literature on derealization and depersonalization is the depersonalization of those around the individual experiencing the dissociation. Derealization conveys unreality to all external objects, including the people around the soldier dissociation. The consequences of failing to perceive other humans as real are important. One notable example is a quote from a soldier who could not accept that the people he was shooting at were human, even with the cognitive knowledge that that was the case. In this sense, does the reaction of derealization based on ideas that it does not feel real because it feels like a simulation or game mean that the enemy is more dehumanized? Dehumanization and psychological distance will be discussed more in-depth in Chapter Four, but it seems likely that this could decrease inhibition to shoot if the enemy does not even feel real, since dehumanization consistently makes it easier for soldiers to shoot and kill. As will also be discussed, dehumanization at the time of combat does not necessarily mean that the soldier will always think of the one killed as less of a human. In fact, it is common for soldiers to feel remorse later as they begin to think of their “victims” in a much more humanized way. This guilt is correlated with PTS symptoms such as re-experiencing. In this convoluted fashion, perhaps killing while experiencing derealization in combat could increase adverse responses such as these.

Conclusion
Collectively, the considerations of perceptions of control and the way they are manipulated during simulations reflect the importance of recognizing what we do not yet understand. While the role control plays in risk and protective factors is substantiated by psychological research and the way simulations foster perceptions of control is suggested by comparative analysis, the intersection of these presents a currently empty but important future field of research. Psychological research searching for ways to foster protective perceptions of control would not only create more competent, efficient soldiers, but would give them better odds to avoid experiencing pathological responses to trauma in the future.

In a similar way, discovering whether peritraumatic dissociation is increased through more prominent use of simulation technologies is vital for not only treating soldiers, but also preparing them for combat in more protective ways.
Chapter Four: Wartime Technologies, Psychological Distance, and Diffused Responsibility

While the previous chapter addressed technology used before combat that later affects combat experiences, this chapter addresses technology used during warfare and combat that instantaneously affects combat experiences. It addresses two lines of psychological inquiry prompted by technological changes affecting the experience of combat. The first addresses the ways distance is manipulated and how this affects soldiers’ experiences with perpetrator trauma (the trauma of injuring or killing). The second addresses how diffusion of responsibility in weapons systems could affect perceptions of accountability and guilt. Ultimately, hypotheses are presented, suggesting specific ways implemented technology increases or decreases risk factors for developing posttraumatic stress symptoms. This future research has implications for preparing and treating soldiers for combat trauma.

Technology used During Warfare

Technology in modern warfare manipulates the distance between soldiers and targets in ways that are important for considering perpetrator trauma. This type of combat trauma is specific to soldiers who cause harm to others, and it has been an important area of study by psychologists (R. MacNair, 2002), given the moral controversy of killing in war and the presence of specific ways to condition killing in war (as discussed in the previous chapter). This chapter is concerned with how Unmanned Aerial Vehicles (UAVs, of which drones are a specific type), planes and accompanying targeting technology, and visually manipulative technology such as
night vision goggles manipulate the perception of psychological distance, and what this means for soldiers interacting with trauma.

As technological advancements increase the distance between soldier and target, many theorists tie the increase of physical distance (discussed later in this chapter as spatial distance) to less emotionality. Christopher Coker (2002), a philosopher of war, writes that since technological advancements allow countries with powerful technology to minimize the costs of war (meaning casualties and sacrifices historically made on the homefront), this increases the distance from the tragic reality of war. In effect, distance decreases the traditional emotional expenditures of war, making it easier to engage in conflict and remain emotionally uninvolved (Coker, 2002). Albert Bandura, a prominent social psychologist, argues that the increased distance involved in newer weapons allows an emotional disconnect from the targets or victims by the perpetrating society in cold ways that border on cruelty (Bandura, 1999). Grossman (2009), an expert in killology, discusses how distance, as a psychological force, can make it easier for soldiers to kill.\(^3\) Because of the collective agreement among experts that distance can decrease emotionality, this claim can be found in most discussions of war and used frequently by soldiers. This chapter seeks to discuss the psychological basis of this mechanism, exploring how psychological distance is created, and the ways it is manipulated by wartime technology.

\(^3\) In fact, his discussions conclude with many of the same conclusions drawn in this chapter, but with a few key differences. As discussed in Chapter Three, Grossman makes frequent psychological claims that are unfounded or without citations, preferring to assert strong causal statements without a scientific base. Because of this, I reference his ideas, but do not rely on his claims.
New technologies also emphasize a systems approach for weapons systems and certain acts in war that both diffuse responsibility and manipulate distance. While the bulk of this thesis considers soldiers who are or will be in combat, weapons systems use many actors who never see combat, but are implicated in combat through the network of the systems approach. The systems approach, as discussed in Chapter Two, is most relevant for weapons systems, but also involves other complicated operations (large-scale battle plans, for example). Weapons systems have become more complex as technology and weapons have themselves become more complex and their execution reliant on a series of steps taken by various actors (Radine, 1977). For example, “A guided missile is only a part of a system; essential to its functioning is the capacity to locate and identify targets and to take into account and interpret large amounts of carried data that might affect its deployment” (Radine, 1977, p. 134-135). All of these steps are separate tasks delegated to different people, all making up parts of this larger system. This system creates team functioning on such an integrated level that it diffuses responsibility for the final action of the system. For weapons system, this means it diffuses the responsibility for killing (Radine, 1977):

No one person seems to be responsible for any act. Who is more responsible for bombing civilians in North Vietnam, the navigator who announces when the aircraft is over the position, the pilot who puts it there, or the bombardier who drops the bombs? And this includes only the men who are up in the air; there are hundreds of men involved at some point in the dropping of bombs (Radine, 1977), 141).

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4 This type of action also minimizes dissent by making obedience mechanically necessitated in smaller actions. This topic is explored thoroughly by Radine (1977), when weapons systems were becoming more significant and commonly used in the military.
Because of the diffuse nature of weapons systems, it expands the scope of responsibility, even involving those who do not directly see combat.

I. Distance and Combat

Memoirs of soldiers discuss the relevance of distance to their combat experience. Many say that the times that they felt psychological pain, anguish, regret, or confusion about killing was when they saw the person die, or found the wallet pictures of the fallen’s family (Coleman, 2006; Dyer, 1985; Grossman, 2009). These stories complement other stories of soldiers dropping bombs and killing hundreds of people without any difficulty sleeping (Marlantes, 2011).

These are examples of ways distance manipulates the psychological perception of killing in combat. Informal theories of distance exist within memoirs and nonacademic psychological books about war. However, using cognitive psychological theories of distance give a clearer picture of the functional mechanisms at work that create psychological distance, and provide theoretical basis for hypothesizing how they affect soldiers’ experiences with killing. Specifically, Construal Level Theory (CLT), theories of dehumanization, and theories of utilitarian moral decision making describe how psychological distance in war manifests, and what this means for killing in combat. Technological advances such as night vision goggles, radar screens, and UAV operating provide further ways to increase psychological distance.

A. Construal Level Theories and Psychological Distance
Liberman, Trope, and Stephan (2007) review the literature on how perceived psychological distance affects other cognitive processes such as “construal, prediction, affect, and choice” (354). Well-known and widely accepted in the field, their theories on the construction of psychological distance and its factors are backed by replicated studies with consistently high validity, strong signs of support for psychological findings.

Any normal perception of reality that involves input not directly experienced (i.e. not witnessed, past event or future event, spatially distant, mediated through someone else, or a hypothetical alternative) involves psychological distance that creates subjective interpretation of distance and reality. The process of perceiving in the mind an event that occurs in reality involves subjective construal of the event based on a variety of cognitive factors. Construal-level theory argues that the more psychological distant an event is, the fewer unique details of the event will be perceived; rather it will be mentally constructed by more prototypical, general information. For example, a soldier seeing someone point a gun at a comrade is

5 Psychological distance is a normal cognitive phenomenon, whereas dissociative experiences are generally pathological in nature, or at least abnormal. The way reality is altered by psychological distance does not make the individual unable to perceive reality or accept its "realness." Instead, it makes certain considerations that would be more tangible in a closer reality less obvious, and more abstract concepts more present (such as recycling--if a person is asked if they would recycle or if they would recycle in three months, it is easy to say yes because you think about the abstract concept of recycling as a good thing to do. If they were asked if they would recycle that day, they might say no because maybe there is not a place to recycle where they are, or it is too difficult to clean the item before recycling. These are specifics of reality that might be lost when considering reality from a more abstracted level). Dissociative experiences affect the fundamental nature of what we typically think of as reality, such as how time works, how things sound, or whether something is fictitious or actual, and is an abnormal process. There is not really an overlap between psychological distance and dissociative experiences besides the hypothesis laid out in Chapter Three about
subjectively interpreted depending on the construal level. On a lower construal level, the type of gun and more details about the man, such as height or clothing, may be noted. On a higher construal level, the concept of “danger” and “needing to defend” are more salient. Certain types of psychological distance influence this complex psychological process, though they all interact to create a spontaneous, holistic interpretation of distance.

The psychological construction of distance involves four contributing types—temporal distance (e.g., “my first day of kindergarten” or “in a few years when I go to graduate school”), spatial distance (e.g., physical distance such as launching a missile thousands of miles away from the target, mechanical distance such as viewing reality through night vision goggles), social distance (e.g., learning about an event through a friend’s description of it), and hypotheticality (e.g., “if I had gone to a different college or if I were a mythical creature”)(Liberman, Trope, & Stephan, 2007). If any of these types of distance are present, then it is a mental construal, malleable to psychological distance phenomena. Levels of construal denote the process of further abstraction through creating more simplistic understandings of the original event. This is explained through cognitive psychological phenomena involving a hierarchical ladder of schematic representations that become broader and less complex the higher the level. This means that fewer details are conveyed about the unique event or object, though the more general information is represented.

how dehumanization could be involved in dissociative experiences. However, dissociative experiences are not involved in psychological distance.
Liberman, Trope, and Stephan further argue that more psychologically distant events are perceived on a higher construal level, and that this operates on a spectrum from a “zero distance point” that involves no psychological distance to the highest construal level that is the most psychologically distant. For example, if a soldier fires a missile from a plane using a radar screen to aim, there is spatial distance through the physical distance between the pilot and the target, there is temporal distance between the time of firing the missile and the time it hits the target, and there is mechanical distance (under the broader category of spatial distance) through the representation of the target as a radar plot. This would be a higher construal level than an infantry soldier firing at the visible enemy in real time. If this soldier were firing at the same physical distance, but targeting while wearing night vision goggles or using thermal vision capabilities, this would have an added layer of mechanical distance, indicating a construal level between that of the first and second example.

Additionally, it is the subjective experience of distance that is important, not the objective distance, in formulating a psychologically distant stance. This is important because it means that even though the physical distance between pilots and their targets and infantry soldiers and their targets is quantifiable, it does not mean it is more psychologically distant than an event that happens at a physically closer distance. Rather, it is the interaction between the different types of psychological distance that produce the spontaneous perception of distance.

Because of this spontaneous, holistic perception of distance, it is especially important to note that the different aspects of psychological distance are interrelated, meaning that even if there is no significant physical distance, the implementation of
mechanical distance can create a perception of greater physical distance, or just an overall experience of greater psychological distance.

**Spatial Distance and Construal Theory:** Spatial distance, as defined by Liberman, Trope, and Stephan (2007) refers to physical distance or the perception of physical distance. The perception of spatial distance, however, can be affected by other factors. Mechanical distance, a type of distance constructed by mediating sensory input through technology, distances what is physically present through making it more abstract and less tangible (Grossman, 2009). As mentioned above, this includes radar screens, which take the image of objects and transfers them to generic pixels with none of their visually descriptive qualities; night vision goggles, which manipulate the coloring and detail of reality (Vasquez, 2008); thermal vision, which similarly manipulates coloring of reality (M. Boot, 2006); and video feed used by operators like UAV pilots, which, independently of spatial distance, mediates reality through poor quality screens (Coker, 2002).

**Social Distance and Construal Theory:** Social distance involves many factors such as culture, politeness, and self versus other (Liberman et al., 2007), but the most relevant for discussing soldiers, combat trauma, and technology is the dehumanized construction of the other through ingroup bias (Haslam, 2006). Dehumanization, discussed more thoroughly in the next section, is the process by which a human is stripped of the qualities of humanity and is considered inferior (Haslam, 2006). This type of distance is not separated by an outside construction like time or space, but rather levels purely constructed cognitively. Times of war foster particularly strong ingroup bias, where group cohesion is necessary for most effective
unit functioning. This includes dehumanization of the outgroup, or the enemy. However, this social distance is malleable to change, as George Orwell famously describes of his war experience, where he once refrained from firing against an enemy soldier when his pants fell down: ‘I didn’t shoot partly because of that detail about the trousers. I had come here to shoot at ‘Fascists’; but a man who is holding up his trousers isn’t a ‘Fascist,’ he is visible a fellow creature, similar to yourself, and you don’t feel like shooting.” (Sherman, 2010). Theories of dehumanization and how dehumanization is perpetuated in the military are discussed in the next section, but it is important to understand its place within social distance in the larger theory of psychological distance and Construal-Level Theory.

**Temporal Distance and Construal Theory:** Temporal distance is relevant both for future events and past events. Many studies use temporal distance as a way to test theories of psychological distance, and their findings have implications for how the way soldiers consider their time in combat changes the more temporally distant it gets.

The larger the temporal distance, the higher the construal level. This means that the farther away the event is, the more abstractly it is interpreted. Less context-specific information, details that would operate on a lower construal level, are emphasized less when the event is farther away. Studies indicate, for example, that temporal considerations of morality consider the abstract concept of morals on a more polarized spectrum the farther away the event in question is. A closer event, for example, would be prone to lower-level construal considerations such as context-specific considerations that would make the moral judgment more understandable.
(Eyal, Liberman, & Trope, 2008). For a soldier presented with a combat situation that is years in the future versus weeks, considerations that operate on different construal levels would have different ratios of importance. If asked to judge the morality of two events—(1) saving a child and (2) killing a civilian—this theory predicts that the first event will be assigned more moral virtue and the second assigned with more pronounced immorality the farther away the event actually is.

Studies of temporal distance also indicate that past actions and future actions are considered with similar temporal distance; that is, events operate based on absolute temporal distance, meaning that an event far in the future and an event far in the past are conceptualized on the same construal level (Liberman et al., 2007). A person asked to remember an event from ten years ago remembers more abstract concepts that operate on higher construal levels about the event than the details that may have been salient at the time. These details operate at a lower-level construal. The process of considering an event that will happen ten years in the future, which will trigger abstract concepts in the same way as ten years in the past, mirrors this process. These considerations indicate that a soldier remembering events that happened during combat could conceptualize it years later with more emphasis on whether what they did was right, rather than what, at the time, made them decide to act in the ways they did. This theory will be especially important during the discussion of guilt later in this chapter.

**Construal-Level Theory, Psychological Distance, and Affect:** Studies also explore how psychological distance interacts with affect, or emotionality. Common understandings assume that emotions decrease with more distance. This is supported
by studies that show certain types of dehumanization (a form of social distance) incite a lower level emotional reaction to those dehumanized than to those (Jack et al., 2013). Others cite the lack of imagery associated with distance, and the human ability to detach emotionally from situations that would normally be emotionally arousing (Bandura, 2002). However, Construal-Level Theory argues that, in the same way that temporal distance, spatial distance, and social distance increase the level of construal, certain emotions operate at higher construal levels than other emotions, and their cognitive place in the context of the event also dictate the level of construal, meaning that certain emotions might actually register more highly at larger distances. Lower-level emotions are anger, sadness, happiness, fear, emotion-based empathy and others that can exist without higher-level cognitive processing. Because it operates at a lower construal level, these emotions theoretically dissipate over distance (whether it is social, temporal, or spatial). However, higher-construal emotions, such as pride, guilt, and specific anxiety (meaning anxiety about a certain source), could increase as distance increases: “social emotions such as pride and guilt involve considering the perspective of other people and hope involves considering the future…it has been suggested that anxiety, contrary to fear, is an apprehension of a potential source of danger (McNaughton & Gray, 2000)” (Liberman et al., 2007) page 372). This has been supported by a preliminary study, which shows that increasing temporal distance is negatively correlated with the presence of anger, a lower-level construal emotion (Liberman et al., 2007).

Empathy provides a specific case study for this theory. Liberman, Trope, and Stephan distinguish between two types of empathy: emotional empathy and cognitive
empathy. “Cognitive empathy involves understanding the difficulties faced by another person, whereas affective empathy involves feeling the other person’s pain” (Liberman et al., 2007). Cognitive empathy requires more conscious understanding and thinking, actions associated with higher construal level. Affective, or emotional, empathy does not require this same conscious appeal, and thus can operate at a lower construal level. This suggests that cognitive empathy increases with temporal distance, since they both operate at a higher construal level (Liberman et al., 2007). These theories, and theories of social distance, are especially important for understanding dehumanization.

**B. Theories of Dehumanization**

Dehumanization has a long presence in military history. It is purposefully implemented in propaganda to build support for wars, and it is often fostered during basic training, whether intentionally or as a by-product of fostering ingroup-outgroup bias. Dehumanization is even more present for soldiers once they are at war. Theorists, studies, and anecdotes explain the many ways that dehumanization, as a psychological process, is present in combat situations (Cohn & Gilberd, 2009; Coker, 2002; Dyer, 1985; Grossman, 2009; Marlantes, 2011; Matthews, 2013; Sherman, 2010; Stouffer, 1949; Stroeken, 2012; Watson, 1978) However, dehumanization is not a homogenous process; it can be further differentiated into types—mechanistic and animalistic dehumanization. These processes have different neural correlates, and are informative for understanding the differing ways they are employed by and create psychological distance.
Types of Dehumanization. With such varying accounts of dehumanization depicted by psychological fields and the media, Haslam (2006) proposed an integrative theory of dehumanization that sought to more concretely distinguish between ways of dehumanizing the “other.” This theory recognizes two different cognitive ways to dehumanize. The first undermines human uniqueness and the second human nature. The category of human uniqueness involves character attributions specific to humans as opposed to animals. It includes descriptions like civility, refinement, moral sensibility, rationality and logic, and maturity. Human nature, however, distinguishes between the human/living and the inanimate. This involves characteristics of emotional responsiveness, interpersonal warmth, cognitive openness, agency and individuality, and depth (Haslam, 2006).

People dehumanize, Haslam argues, on the basis of these two, distinct levels of humanness. They either engage in dehumanization that robs the person of their human uniqueness, or they take away their human nature. One is animalistic (human uniqueness), the other is mechanistic (human nature).

Animalistic dehumanization entails considering a person as coarse, amoral, irrational, childlike, or lacking culture or self-restraint. Seeing someone as operating on instinct rather than logic is also characteristic of this type of dehumanization (Haslam, 2006). Animalistic dehumanization is consistently employed in propaganda. Nazi representation of Jews before and during the Holocaust described Jews as rats, subhumans who were a disease that needed to be eradicated (Zimbardo, 2007). Posters produced and propagated by the United States also depicted Japanese soldiers as rats caught in traps set by U.S. soldiers during the Second World War (Dower,
2012) and the Germans as aggressive, terrifying apes during the First World War. These depictions, collectively, sought to increase abhorrence and disgust felt toward the enemy and convey that they deserved to be killed (Orwell, 1946). Soldiers engage in this type of dehumanization frequently during combat. Linguistic devices support the attribution of animalistic dehumanization, often through derogatory words that emphasize repulsive aspects stripped of humanity. Calling the enemy ‘krauts’ in the Second World War, ‘gooks’ in the Vietnam War, and ‘rag-heads’ and ‘A-rabs’ in Afghanistan and Iraq suggest inferiority and lack of “civility” (Sherman, 2010). Euphemizing killing can also convey dehumanization through word choice. For example, by saying the target was “hosed” or “zapped” (Grossman, 2009), it connotes the fate of a bug that got too close to light, not the fate of a human with agency and cognitive processes.

Animalistic dehumanization is also heavy in imagery and emotional arousal. Specific images or words conveying hostile, amoral, or irrational traits are common. They incite emotional reactions that remove the humanistic and emphasize the animalistic. Neuroimaging studies indicate that animalistic dehumanization is associated with the emotional response of disgust, a relatively high emotional arousal. Neuroimaging responses to extreme outgroups have been found to show less activation of medial prefrontal areas, the parts of the brain most associated with humanizing, and instead show higher activation of the left insula and right amygdala (Harris & Fiske, 2006). This pattern of activation is consistent with a reaction of disgust, specifically disgust in response to objects (Schäfer, Schienle, & Vaitl, 2005). Studies have also found that attribution of secondary emotions (affection, admiration,
pride, conceit, nostalgia, remorse, etc.) in situations of strong ingroup bias is limited to the ingroup, and primary emotions (anger, fear, and other emotions associated with lower-level cognitive processes) are attributed more consistently to the outgroup rather than the reverse (Leyens et al., 2000). These emotional attributions align with Haslam’s description of animalistic dehumanization. Attributing strong primary emotions such as anger or fear supports perceptions of irrationality and lack of restraint, key ideas represented by animalistic dehumanization. This highlights that dehumanization is both closely tied with outgroup prejudice, and with emotional arousal.

In contrast to the emotional arousal of animalistic dehumanization, mechanistic dehumanization does not view the person with disgust, but rather with no attribution of emotion or agency. Mechanistic dehumanization is characterized by perceiving someone as inert, cold, passive, or superficial (Haslam, 2006). While these words also define people perceived as emotionless and callous, it more often refers to a lack of consideration of autonomy, agency, or emotion of any kind. Collectively, this category equates humans with the inanimate, with objects or mechanistic operations similar to computers. This is often seen in medical fields, where the agency or autonomy of a person is disregarded in favor of a more objectified view of the patient, as something that needs fixing (Glasser, 2011; Haslam, 2006). This is often implemented linguistically through discussing casualties in war. The body-count mentality of the Vietnam War, for example, capitalized on objectification—a form of mechanistic dehumanization—by counting the number of dead Viet Cong (Krepinevich Jr, 2009), a quantitative, empathy-less method of measuring success.
This is also present in more recent asymmetrical conflicts in the form of “collateral damage,” the sanitized term for civilian casualties, such as casualties of drone strikes (Brunstetter & Braun, 2011).

This representation of mechanistic dehumanization in the conduct of war emphasizes the way that engaging in mechanistic dehumanization avoids emotional arousal, often in place of feeling a disturbing emotional response. It separates the emotion from the words, rendering those who could have been humanized merely as inevitable objects part of a complicated situation. They can more easily be viewed as a means to an end, or simply placed into the category of unfeeling and inert, hallmarks of mechanistic dehumanization (Haslam, 2006). George Orwell provides an interesting metaphor for mechanical dehumanization, saying that it “anesthetize[s] a portion of one’s brain” (Orwell, 1946). This language, and this type of dehumanization, distances the subject from the object in a way that avoids imagery and emotionality, in stark contrast to imagery-specific and emotionally productive effects of animalistic dehumanization (Jack et al., 2013).

C. Utilitarian Moral Decision Making, Dehumanization, and Distance

Studies of utilitarian moral decision-making show that people are more likely to make sacrificial decisions if more distance and more dehumanization are present. In a study examining whether moral judgment is accomplished by intuition or conscious reasoning (Cushman, Young, & Hauser, 2006), three different principles of harm were investigated. These were “(a) Harm caused by action is worse than harm caused by omission, (b) harm intended as the means to a goal is worse than harm foreseen as the side effect of a goal, and (c) harm involving physical contact with the
victim is worse than harm involving no physical contact” (Cushman et al., 2006). These are more concisely described as the action principle, intention principle, and contact principle, respectively. This was tested through coded scenarios, equivalent to scenarios presented in studies testing utilitarian moral decision-making. The researchers found that “the extent to which conscious reasoning or intuition plays a more dominant role depends on the particular moral principles triggered: The intention principle seems best characterized by the intuitionist model, the contact principle by intuitive judgment followed by rational reflection, and the action principle either by conscious reasoning or, at a minimum, by post hoc conscious reasoning” (Cushman et al., 2006). This study utilized examples often used in what is referred to as the trolley dilemma. With a trolley running out of control (either with or without people inside), a lever (or switch) and a person or people on the track, the situation can be manipulated to represent multiple different utilitarian decisions weighed against a non-utilitarian option. Examples of this include pushing the lever to switch the out-of-control, empty trolley from hitting five rail workers to only hitting one rail worker, or pushing a man off of the footbridge onto the track to stop the trolley and save all of the people on the doomed trolley (Cikara, Farnsworth, Harris, & Fiske, 2010). Different percentages of utilitarian outcomes have been documented based on these different situations that all end with a sacrifice, just achieved in different ways (ratio of those saved). As described by Cushman’s study (2006), different levels of harm can explain why one situation might be more morally acceptable than another, perhaps explaining how these utilitarian responses can be manipulated through the framing of the situation.
One study focusing on a trolley-track utilitarian dilemma tested whether people would be more willing to make a utilitarian decision if the person being sacrificed was someone they deemed an outgroup member, and how extreme this outgroup had to be in order to make a difference (Cikara et al., 2010). They used the third level of harm tested by Cushman (2006), asking if the participant would push the person onto the track, involving the participant to imagine physically sacrificing the person. As predicted, they found that participants saved ingroup members more frequently than outgroup members, and that extreme outgroup members were most likely to be sacrificed for the utilitarian decisions.

Majdandzic (2012), however, offers another way to change the ratio of utilitarian responses given. Rather than examining dehumanization, this study aimed to examine humanizing the potentially sacrificed person. While examining the percentage of utilitarian choices to establish significance, the study also examined neural correlates to establish whether the humanized condition affected moral decision making. The researchers hypothesized that the humanized condition would result in fewer utilitarian responses than the neutral condition (Majdandžić et al., 2012).

Participants in the humanized condition were primed through requiring mentalizing of the fictitious person, while no mentalizing was required in the neutral condition. Specifically, the persons’ thoughts and feelings were described (their mental states) to the participants, who were subsequently asked to take their perspectives. The neutral condition exposed participants to purely factual descriptions of the persons’ appearances and ages, and then asked questions related to non-social
reasoning. The dilemmas the participants were exposed to simulated typical utilitarian judgments used in most moral decision-making experiments.

The participants were also asked to fill out a questionnaire that fleshed out in which ways they had humanized the fictitious persons. The questions asked were:

1. How likable do you find this person?
2. **How connected do you feel to this person?**
3. How valuable do you find this person?
4. How attractive do you find this person?
5. How annoying do you find this person?
6. **How well do you understand this person?**
7. **How well do you feel you know this person?**
8. **How similar do you find this person to yourself?**
9. How necessary was it to take this person’s perspective to answer the questions about him?
10. To what extent did your opinion about this person affect your decisions?

The bolded questions above are the questions that were found in a post hoc analysis to most strongly correlate with effective humanization. Underlying all of these questions is the closeness and similarity to the participant. In effect, these questions tested how strongly the person was perceived as part of an ingroup. Incorporation in the ingroup allocates more deservedness of empathy and human essence. This part of the study is of particular relevance to the importance of ingroup-outgroup. The questions asked did not focus on aspects of humanness that Haslam, for example, would deem most important. Rather, these questions effectively show whether the person was accepted into an ingroup. By default of placing the person in an ingroup, he or she is humanized, but this calls into question the validity of this assessment specifically focusing on humanizing factors, given that a person can be humanized without questioning whether you feel similar to the person or not.
These studies indicate that the use of dehumanization in decision making can result in more utilitarian decisions, meaning that people—in this theoretical framework—who are dehumanized are more likely to be sacrificed, and the people who are humanized are less likely to be sacrificed.

Hypotheses and future research

The intersection of utilitarian moral decision making and construal level theories of psychological distance suggest that morality would operate at a higher level of construal given that utilitarian moral decision-making models operate on hypotheticality, a level of psychological distance. This is important because it reveals two different avenues of consideration. The first is that because the participants are operating at a higher construal level, their moral decisions are more polarized than they would be at less psychological distance (for example, if this were a real situation rather than a hypothetical one). This means that these judgments do not actually indicate that the participants would make the same decision if they knew their decision would actually be sacrificing a life or allowing people to die. However, they are still informative for understanding the ways dehumanization can manipulate decision-making, and that it does have an effect on decisions.

The second avenue of consideration is that perhaps, given the finding that psychological distance is perceived holistically, utilitarian decisions in reality would not differ greatly from the hypothetical decisions made in utilitarian decision studies. That is, if enough distance is employed that it amounts to the same psychological distance employed during hypothetical utilitarian decision-making, then the same moral decision could be made in reality that was made in the hypothetical utilitarian
study. This outcome would indicate that utilitarian moral decision making studies could accurately predict decisions made in reality, assuming that they operate at a similar psychological distance. Given that many of the decisions in war operate at higher construal levels because of increasing distance, this suggests that similar utilitarian judgments would have external validity.

More studies of Construal Level Theory, psychological distance, utilitarian moral decision making, and dehumanization are necessary to further understand these nuances. If utilitarian moral decisions are made at the same psychological distance/construal level for both hypotheticality and other forms of distance such as spatial distance (a pilot operating a drone) or social distance (dehumanized enemy), then studies can use hypotheticality to more confidently predict what decisions would be made in reality. Since controlled studies cannot be designed in reality making decisions for who lives and who dies, this would be an excellent way to gain more specific information, and generate stronger claims, even causal relationships, about how distance and dehumanization affect soldiers’ decision making.

Hypotheses 2A, 2B, and 2C discuss how wartime technologies increase distance and dehumanization, and hypothesis 2D ties these considerations to future posttraumatic stress symptoms. Collectively, hypotheses 2A-2D suggest that increasing distance and dehumanization, while making combat emotionally easier to handle at the time, do not protect soldiers from developing pathological reactions to trauma in the long run.

**Hypothesis 2A: New Technologies in War (separated in more detail below) are increasing psychological distance between soldier and target.**
What is the level of psychological distance typically perceived by soldiers on the ground, UAV operators, and pilots? And how do they compare? These questions are important to answer to (a) corroborate the application of construal level theories of psychological distance to combat experiences, and (b) understand how physical distance (spatial distance) plays a role in manipulating perceived psychological distance. Future research could use existing models that study psychological distance but incorporate scenarios present in combat for varying levels of physical distance. These findings would help distinguish the levels of perceived psychological distance (and operating construal level) generally perceived by those operating at a mechanical distance (night vision goggles, thermal vision, or radar use, for example), those operating at spatial distance (UAV operators and pilots), and those operating at social distance (dehumanization, whether mechanistic or animalistic).

**Spatial Distance:** Studies of spatial distance strongly indicate that physical distance increases psychological distance, meaning that the implementation of spatial distance through UAV operations would naturally increase psychological distance. However, studies could examine this more closely by questioning UAV operators. Given that psychological distance is a holistic judgment, testing level of social distance through dehumanization could show whether spatial distance is effective in increasing the overall level of psychological distance. Hypothesis 2B is a more specific exploration of dehumanization and spatial distance. Another important study fleshing out this hypothesis could compare the level of psychological distance between UAV operators and pilots. As UAVs become more and more common, this
would have particular significance for understanding whether psychological distance operates at a higher level for UAV operators than in-plane pilots.

Mechanical distance: Studies could be designed to test how the use of night vision goggles, thermal vision, or other forms of mechanical distance affects the level of psychological distance perceived. This would be straightforward to test in a controlled experiment that had participants either witness or interact with people at zero spatial distance. The experimental group would witness or interact with people through a form of mechanical distance. Psychological distance could then be tested in a number of ways. One study uses the measurement of politeness, noting that people are more polite the more they perceive psychological distance (Stephan, Liberman, & Trope, 2010). In this case, interactions could be coded for politeness, with more politeness indicating a higher level of psychological distance. Psychological distance could also be measured through the amount of dehumanization, which would be more applicable for generalizing to combat situations. In this case, participants could witness others interacting, and then be presented with a series of questions designed to establish the amount the participant dehumanized those witnessed. If supported, this hypothesis would provide a foundation for understanding how visual technology that mediates reality can affect psychological distance, which has implications for dehumanization and perpetrator guilt.

Hypothesis 2B: UAV operators and pilots are more likely to engage in mechanistic dehumanization than animalistic dehumanization of enemies.

This is predicated on the research that indicates less emotionality is associated with mechanistic dehumanization, and less emotionality is associated with killing from a
spatial distance. If the level of emotionality is relevant to both of these considerations, then it suggests that the type of dehumanization involved focuses on considerations of agency and animation rather than civility or hostility, for example. This is important for further understanding the state of mind for UAV operators and pilots.

**Hypothesis 2C: Troops operating at lower levels of spatial distance experience more animalistic dehumanization than mechanistic dehumanization.**

This is predicated on the research that suggests that disgust is associated with high emotional arousal, and high emotional arousal is associated with close combat. This would also suggest that social distance would be amplified through dehumanization, which would be an important finding for understanding how soldiers consider their targets in emotionally charged, violent situations. This hypothesis is anecdotally supported by soldiers (Marlantes, 2011), and also suggested by Grossman (Grossman, 2009).

**Temporal Distance Hypotheses**

Hypothesis 2D contains three different parts: 2Da, 2Db, and 2Dc. They discuss the same area of research but with nuanced approaches. Liberman et al. hypothesized that guilt operates at a high construal level, a hypothesis predicated on research indicating that guilt is a higher-level construal emotion, and psychological distance at high-level construal is more strongly associated with higher-level construal emotions. The results of this study would be informative for the following hypotheses. If guilt were shown to be a higher-level construal emotion that increased as psychological distance increased, then more time away from combat (increasing
temporal distance) could increase feelings of guilt. Guilt, as discussed in Chapter Two, is a risk factor for problematic coping methods that increase the likelihood of pathological reactions to trauma (Held et al., 2011; Henning & Frueh, 1997; Owens et al., 2009).

Hypothesis 2Da: Dehumanization dissipates as cognitive empathy increases over time.

Hypothesis 2Db: As guilt increases so does cognitive empathy.

Hypothesis 2Dc: As temporal distance from combat increases, so does guilt and cognitive empathy.

As discussed previously, construal level theory specifically predicts that emotional empathy is more likely than cognitive empathy to decrease over social distance. The theory of mechanical and animalistic dehumanization supports this prediction as emotional empathy is proven to be virtually nonexistent in animalistic dehumanization, evidenced by severe dehumanization and feelings of disgust toward outgroups (Harris & Fiske, 2006). Mechanistic dehumanization, as a system stripped of emotion, would also not support emotional empathy because there is no attribution of emotion of any kind to the dehumanized. The argument that the implementation of cognitive empathy would be less affected over distance appears to take issue with theories of dehumanization that increase psychological distance. However, dehumanization is itself an active process of implemented social distance that purposefully negates the type of thinking involved in cognitive empathy. Considering increasing temporal distance from the “here and now” of dehumanization offers an interesting take on Construal-Level Theory. Dehumanization involves low-level
construal emotions through animalistic dehumanization (namely disgust, anger, and fear (Jack et al., 2013), and mechanistic dehumanization involves a general lack of transcending the “here and now” to think of the agency, emotionality, or simply presence of the “other” by implementing greater social distance. More temporal distance away from these two processes of dehumanization would trigger higher-construal level considerations of those originally dehumanized. This could less easily prompt the original “here and now” feelings associated with dehumanization and more easily prompt higher-level emotional affect, such as cognitive empathy.

Specific studies exploring whether dehumanization dissipates over time do not yet exist, but evidence for it exists not only through Construal Level Theory, but also through anecdotes by soldiers. Marlantes, for example, says that while he was killing, he felt exhilaration, anger, and strong dehumanization toward those he was shooting at, but now he just feels sadness (Marlantes, 2011). He thinks of those he killed as people, not as the dehumanized names and perceptions fostered by the emotions of combat (Marlantes, 2011). Another soldier expresses cognitive empathy while both spatially and temporally distanced from combat. Discussing the motives of those who drop roadside bombs in Iraq, he says that they are trying to get by in an uncertain time, and incentivized through safety or money, “So how would I feel about killing someone who wouldn’t do evil things, wouldn’t kill others, wouldn’t try to destroy the security of his own country except for the fact that he has to feed his family? That’s where it starts to get a little more difficult” (Sherman, 2010, p. 35). These examples of dissipating dehumanization are important because they align with Construal Level Theory, which suggests that psychological distance increases
cognitive empathy and guilt. Guilt is a powerful risk factor for posttraumatic stress symptoms.

    Through a network of association, this suggests that as technology increases distance, it increases psychological distance such as dehumanization, which then dissipates as combat trauma becomes temporally distant. While the types of actions that could produce guilt are beyond the scope of this thesis (such as killing to protect a comrade, committing an atrocity, or survivors guilt), the findings of hypothesis 2D would be informative for conducting research about these specific forms of guilt as well. These findings would inform posttraumatic stress treatments and preemptive care.

   II. Diffusion of Responsibility, Agency, and changing definitions of trauma

   Diffusion of responsibility, the construction of culpability, and changing definitions of trauma facilitate how systems approach could make it possible to manipulate risk factors such as perpetrator guilt. As weapons systems become more elaborate and computer-driven, this will be especially important for maintaining focus on the humans involved, and the ways to more successfully protect them from developing posttraumatic stress symptoms.

   Diffusion of Responsibility

   Social psychology offers a dense field of research into group perceptions of responsibility. Psychologists hypothesized that when something happens that either requires action or action is taken, the larger a group, the more responsibility lessens per person (Darley & Latane, 1968). This is known as diffusion of responsibility, and helps explain a wide range of findings including findings of studies including
bystander intervention and group violence (Bandura, Underwood, & Fromson, 1975; Darley & Latane, 1968; Freeman, Walker, Borden, & Latane, 1975).

Often, diffusion of responsibility is associated with the bystander effect, where, in response to a problem requiring action, the larger the group, the less likely it is that someone will take responsibility and act (Darley & Latane, 1968). However, diffusion of responsibility also applies to actions taken by a group, and the way that responsibility for actions already taken can similarly fade as the group expands (Darley & Latane, 1968).

Moral disengagement is also enabled by diffusion of responsibility (Bandura, 1999), which allows a detachment from usual morals to either justify an action taken by someone else or an action taken by the person themself. Both of these, Bandura argues, can increase aggression and dehumanization of victims (Bandura, 1999). These processes are important for group action and for underlining the powerful effects of these psychological processes. Bandura’s theories and the theories of psychological distance and ingroup bias discussed in the previous section indicate the interrelatedness of dehumanizing phenomena with group psychology, and the importance of recognizing the complicated way they manifest.

In terms of the system approach, diffusion of responsibility is particularly relevant for weapons systems because of the targeted, violent outcome of the system. When a bomb is dropped, for example, the question is, who is responsible? The theory of diffusion of responsibility suggests that this responsibility could break into small pieces proportional to the number of people involved in the weapons system, meaning that perception of responsibility could extend to people not even present in
combat, or witnessing combat, but also to people further back in the chain of
decisions and actions that led to the final drop of the bomb.

**Changing Definitions of Trauma**

As discussed in Chapter Two, subjective interpretation of an event as
traumatic is more important than an objective assignment of an event as traumatic.
This is the source of controversy over Criterion A (the traumatic event prerequisite of
the DSM-V’s PTSD diagnostic description) which attempts to objectively describe
types of trauma that “qualify” for the diagnosis (Weathers & Keane, 2007). However,
what is more important is the subjective experience of the traumatic event. Just
because someone experiences something objectively described as traumatic, or is
perceived as traumatic to one person, does not mean they will inevitably experience
traumatic reactions or even perceive it as traumatic. Similarly, an event that would be
objectively described as less traumatic may be perceived more traumatically by one
individual than an event objectively described as more traumatic experienced by
another. This emphasis on subjectivity suggests that the definitions of a traumatic
event should be more fluid, and more strongly emphasize the importance of the
subjective experience rather than the objective definition. Recently, a study was
published highlighting the traumatic effect of shame, arguing that shameful events
can be just as triggering as traumatic events for developing symptoms of
posttraumatic stress disorder (Matos & Pinto-Gouveia, 2010). Collectively, this
highlights the importance of subjectivity in trauma, and how changing definitions of
trauma suggest the future for understanding development of pathological reactions to
the initial stressor (whether it is an objectively traumatic event, or structured through alternative means).

**Hypotheses and Future Research**

**Hypothesis 2E: As those involved in a weapons system increases, responsibility becomes more diffused.**

This is asserted by Radine (1977), but not as a formal hypothesis. However, this could be investigated, and would be vital for understanding how those involved in weapons systems perceive culpability of the final action, and how self blame is involved. These findings could be imperative for accounting for symptoms of perpetrator trauma (PTSD) for soldiers who technically do not see combat, but are a part of the weapons systems that cause harm in combat.

This should be studied to ascertain how soldiers involved in weapons systems perceive culpability. Surveys of soldiers would provide initial evidence of whether diffusion of responsibility has a perceptible effect.

**Hypothesis 2F: Psychological distance between soldier and target is increased by involvement in weapons system.**

Borrowing from psychological distance theories discussed previously, this also means that since many of these soldiers are operating at significant distance, their construal level of the situation is more abstract. This, similar to theories of UAV operators and pilots who initially act at more distance than troops on the ground, suggests that spontaneous appraisal of psychological distance by soldiers involved in a weapons system would evaluate the enemy/target with higher levels of psychological distance, but still be prone to developing more guilt and empathy as time passes.
Conclusion

Psychological insight into the unintended consequences of technology and how it changes the nature of combat experienced by soldiers is important for present preparation, in-combat treatment, and post-combat treatment for soldiers not only involved in combat, but also involved in weapons systems. This research has the potential to change the way soldiers are taught to think about the enemy and trained to shoot with or without considerations of humanity. It also promises to refocus the military not on efficiency, but on holistically creating a soldier who has less difficulty integrating perpetrator trauma into the moral framework that guides civilian life post combat.
Chapter Five: Conclusion

This thesis has considered two categories of technology used by the United States military and explored ways they affect soldiers’ experiences and reactions to combat trauma in order to expand this largely omitted field of psychology. The trends in technological advancement generally refer to two different areas related to combat: technology used before warfare—simulations technologies used through virtual reality and video/computer game—and technology used during warfare—weapons technologies, aircraft, vehicles, communications and computer technologies.

Chapters Three and Four suggested specific hypotheses and studies that, if pursued, would not only provide a deeper understanding of the dimensions of combat trauma for soldiers in modern warfare, but would also provide steps to better prepare soldiers for combat. Chapter Three discusses simulation technologies, the main technology used before combat, and hypothesizes that simulation technologies simultaneously increase the likelihood of reflexively killing in combat and experiencing peritraumatic dissociation and increase the likelihood of perceiving higher levels of control during combat. Chapter Four discusses technologies in warfare that manipulate actual and perceived distance (night vision goggles, aircraft, UAVs) and are involved in weapons systems (systems approach). It hypothesizes that new technologies in war are increasing perceived psychological distance (including dehumanization), which dissipate over time. It also hypothesizes that dehumanization dissipates as cognitive empathy and guilt increase over time (risk factors for PTSD). Chapter Four further hypothesizes that weapons systems increase diffusion of
responsibility and psychological distance, which have implications for perceptions of responsibility/guilt and the changing face of understanding trauma.

More broadly, this thesis provides a rationale for exploring the unintended effects of implementing certain technologies on soldiers’ mental health, and highlights the importance of pursuing research into these effects to more effectively support soldiers in the future. While theories and studies that focus on soldiers’ experience with technology are lacking, the discussion of what this rapid increase in technology will mean for war and humanity is more present in the literature. The direction of future technologies and war emphasize the minimization of casualties (both physical and psychological), much as current technological advancements have done. This minimizes human involvement with warfare, and replaces human judgment with more mechanistic modes of analysis. Making more educated decisions about technological products will be imperative as technology advances toward “post-human” conflict, in which human involvement is minimized and further marginalized. Examples of future technology such as UAVs, computer intelligence/analysis, and pharmacological advancements show different types of post-human warfare. Ultimately, they emphasize that this trajectory could further marginalize soldiers as agents in need of psychological attention and focus in research by the military, much as the studies suggested throughout this thesis. Because soldiers will still be involved and affected by war, the hypotheses made throughout this thesis will continue to be important as technologies (such as those discussed below) continue to advance.

**UAVs and Human Presence**
Like many other technological advancements, UAVs and their rapid implementation have outpaced “thorough ethical and policy analysis” (Strawser, 2013). While current ethical concerns of UAVs/RPVs are now involved in analysis, this conversation is still in its infancy (Strawser, 2013). However, just as the production of UAVs outpaced analysis in the first place, more autonomous intelligent machines are under construction that require an entirely new frame of discussion.

George R. Lucas, a distinguished Professor of Ethics and Public Policy who previously taught at the United States Naval Academy discusses how the future of UAVs would redirect this conversation. Currently, the most controversial actions taken using UAVs are:

(1) Assassination or “targeted killing,” especially across or within the sovereign borders of nations with whom we are not formally at war.
(2) Collateral damage to innocents and their property; and thereby
(3) Magnifying the probability for errors in targeting judgment (i.e., mistakes) that would not otherwise be made (since many of the missions in question could not otherwise be undertaken); and
(4) Perhaps most troublingly, increasing the opportunities and incidents of use of deadly force in a military context by nonmilitary personnel (such as civilian intelligence operatives, or private security contractors).

(Strawser, 2013, p. 212)

However, the use of autonomous UAVs would mean that “only machines (and not persons) are undertaking the activities in question. In short, we can make many of the moral and legal anxieties raised by the policies and practices considered in the other essays in this volume simply disappear, merely by redefining the activities in question as involving ‘machine behavior exclusively’ and hence immune from the charges leveled against the remotely piloted missions” (Strawser, 2013, p. 213). In this case, he argues, robots “cannot commit war crimes per se, but only malfunction or make mistakes, [and] require a radically different metric for assessment than the moral one
we tend to apply. Moral evaluation of behavior pertains solely to human agents. For robots, as our tools, by contrast, we must talk instead about safety, reliability, and risk” (219). This potential future highlights the dramatically different concerns and discussions needed for robotic technology and intelligence. This would create a situation where those committing such acts feel no emotion and harbor no guilt, and reflect on their creator through programming failure, not through moral transgression, because morality, along with humanity, is removed from this act of war. While this analysis does not mean that acts cannot be regulated and punished, it does emphasize a departure from humanity, emotions, and morality through the implementation of more progressed technology. However, to see this as acts of war entirely separated from human presence would be misguided. It does not remove repercussions for humans involved with the conflict. Questions of guilt would remain imperative, as would considerations of diffusion of responsibility and the changing nature of trauma.

**Systems Approach and Human Responsibility**

The removal of humanity in favor of mechanistic intelligence is evident not only through robotics technology, but also through a stronger push towards systems approach. Systems approach formulates a broader action as a series of prescribed steps, with specific jobs and tasks at each step collectively achieving the larger goal. This is described in chapter four through weapons systems. However, the improvement of technology and intelligence of computers threatens the subordination of humans to technology, in essence eradicating humanity from the system’s construction. In fact, Christopher Coker, a Professor of International Relations and
head of the IR department at the London School of Economics, argues that this is already happening. Technology, he says, is now considered not a way to enhance humans’ abilities, but to replace them. “No longer are human beings the measure of war; instead, machines are threatening to make soldiers redundant, emeritus, and retired before their time. It has been happening for years. As computers have continued to provide a faster, more comprehensive array of data, human operations have become more subordinate to machines than ever; as technology evolves, so have human actions” (Coker, 2002, p. 172). Subordinated and relegated to the margins, humans become cogs in a machine to produce a mechanistic, technological product of war rather than a human action built by other humans. This is further perpetuated in future technological development by the attempt to merge human and machine through pilots. Connecting pilots’ brains to computers technology to transfer analyzed information to the pilot more quickly would make aircraft operations more reactive, streamlined, and effective. However, it further subordinates human action to machines’ analysis and intelligence. Focusing on technology and mechanical brains, the road which this technology is speculated is expected to take, does not eliminate human emotionality, anxiety, and cognizance. Theories of how soldiers operate within weapons systems with reference to traumatic reactions will remain integral to properly supporting these soldiers, as Chapter Four argues of the present.

The Danger and Promise of Pharmacology, Erasing Human Nature

Current drugs in development and avenues for future development merit consideration in this section, though they are not yet used in response to wartime psychological casualties.
The Pentagon’s highly funded defense project, DARPA (Defense Advances Research Projects Agency) has taken an interest in neuroscience recently (Marchant & Gulley, 2010). This takes shape in many forms, but a large one is pharmacological research. DARPA is particularly interested in ways to help soldiers function effectively without sleep (Tennison & Moreno, 2012). If exhaustion could be eliminated, then soldiers could cognitively function past the thirty-six hour mark, boosting the military’s effectiveness and hours of operation (Tennison & Moreno, 2012). DARPA is also working to produce a drug that would dampen traumatic memories enough that they would not cause posttraumatic stress disorder (Pitman et al., 2002). Other drugs promise to manage anxiety and stress responses in more adaptive ways for soldiers.

All of these drugs promise ways to create more efficient soldiers through manipulating brain processes. However, drugs that produce more efficient soldiers do not necessarily produce healthier individuals in the long run. This underlines the importance of caution in military decisions based on neuroscience. Drug testing follows an entirely separate process from military technology use. Generally speaking, the military uses technology as soon as possible, while drugs undergo trial after trial. This process is important to thoroughly understand the side effects, and know what will happen to those ingesting the substance. This is why these drugs are still in development.

Drugs that work to protect soldiers from developing combat stress reactions and posttraumatic stress reactions should be categorized differently here from drugs that solely work to make a soldier more efficient in combat, even though the two are
related. For example, the drugs that work to make a soldier function past normal waking hours is not beneficial to the soldier’s health, only to the military’s productiveness (Matthews, 2013). However, a drug that would help soldiers cope with traumatic memories would be both beneficial to the military (if only by saving disability fees post combat) and to the soldier.

The pursuit of pharmaceutical technology emphasizes the intersection of psychological science, neuroscience, and military needs. As the military moves forward with this, they will be more successful in producing beneficial drugs with less backlash if they focus on paths that benefit both the soldier and the military, rather than simply the military.

If technology is now capitalizing on psychology, it is directly working to manipulate behavior or work with the mind and brain in specific ways. In this case, it is even more important that research examining the effects of implementing steps like this do more than just say whether they were effective for their original intention. We need to know how soldiers are affected by implemented technology, and the best way to do that is through thorough studies. Examples of this use of psychological science to influence technology are apparent in simulation use and behavioral conditioning. Pharmacology is another direct example. The focus of DARPA’s work in neuroscience also leads us in this direction.

This discussion is inextricably tied to technology and psychology. In some ways, the psychology discussed above focuses solely on making soldiers healthier, but in other ways, this psychology is working toward the end of efficiency and competency in soldiers’ actions and behavior in combat. This junction is where
history indicates the tricky nature of using psychological understanding to manipulate psychological processes, and moving forward, underlines the need to constantly refer back to thorough studies and important considerations for being human. As technology becomes more mechanized, and people continually cogs in the machine of war and parts acting in actual machines, psychology and other disciplines can give us a better understanding of what the effects are on the people working closely in this atmosphere. Rather than just prescribing new ways to make soldiers effective, this science can give us just as much understanding of what soldiers are going through, and how better to prepare and treat them.
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Appendix A: DSM-V Diagnostic Criteria for Posttraumatic Stress Disorder

Criterion A: stressor

The person was exposed to: death, threatened death, actual or threatened serious injury, or actual or threatened sexual violence, as follows: (one required)
1. Direct exposure.
2. Witnessing, in person.
3. Indirectly, by learning that a close relative or close friend was exposed to trauma. If the event involved actual or threatened death, it must have been violent or accidental.
4. Repeated or extreme indirect exposure to aversive details of the event(s), usually in the course of professional duties (e.g., first responders, collecting body parts; professionals repeatedly exposed to details of child abuse). This does not include indirect non-professional exposure through electronic media, television, movies, or pictures.

Criterion B: intrusion symptoms

The traumatic event is persistently re-experienced in the following way(s): (one required)
1. Recurrent, involuntary, and intrusive memories. Note: Children older than six may express this symptom in repetitive play.
2. Traumatic nightmares. Note: Children may have frightening dreams without content related to the trauma(s).
3. Dissociative reactions (e.g., flashbacks) which may occur on a continuum from brief episodes to complete loss of consciousness. Note: Children may reenact the event in play.
4. Intense or prolonged distress after exposure to traumatic reminders.
5. Marked physiologic reactivity after exposure to trauma-related stimuli.

Criterion C: avoidance

Persistent effortful avoidance of distressing trauma-related stimuli after the event: (one required)
1. Trauma-related thoughts or feelings.
2. Trauma-related external reminders (e.g., people, places, conversations, activities, objects, or situations).

Criterion D: negative alterations in cognitions and mood
Negative alterations in cognitions and mood that began or worsened after the traumatic event: (two required)

1. Inability to recall key features of the traumatic event (usually dissociative amnesia; not due to head injury, alcohol, or drugs).
2. Persistent (and often distorted) negative beliefs and expectations about oneself or the world (e.g., "I am bad," "The world is completely dangerous").
3. Persistent distorted blame of self or others for causing the traumatic event or for resulting consequences.
4. Persistent negative trauma-related emotions (e.g., fear, horror, anger, guilt, or shame).
5. Markedly diminished interest in (pre-traumatic) significant activities.
6. Feeling alienated from others (e.g., detachment or estrangement).
7. Constricted affect: persistent inability to experience positive emotions.

Criterion E: alterations in arousal and reactivity

Trauma-related alterations in arousal and reactivity that began or worsened after the traumatic event: (two required)

1. Irritable or aggressive behavior
2. Self-destructive or reckless behavior
3. Hypervigilance
4. Exaggerated startle response
5. Problems in concentration
6. Sleep disturbance

Criterion F: duration

Persistence of symptoms (in Criteria B, C, D, and E) for more than one month.

Criterion G: functional significance

Significant symptom-related distress or functional impairment (e.g., social, occupational).

Criterion H: exclusion

Disturbance is not due to medication, substance use, or other illness.

Specify if: With dissociative symptoms.

In addition to meeting criteria for diagnosis, an individual experiences high levels of either of the following in reaction to trauma-related stimuli:
1. **Depersonalization**: experience of being an outside observer of or detached from oneself (e.g., feeling as if "this is not happening to me" or one were in a dream).

2. **Derealization**: experience of unreality, distance, or distortion (e.g., "things are not real").

*Specify if*: With delayed expression.

Full diagnosis is not met until at least six months after the trauma(s), although onset of symptoms may occur immediately.
Appendix B: Peritraumatic Dissociative Experiences Questionnaire (PDEQ)

RAND Peritraumatic Dissociative Experiences Questionnaire

Now I would like you to try to remember how you felt and what you experienced at the time of the (attack) and immediately afterward. I'm going to read some statements that may describe how you felt during that period, and I'd like you to tell me how true each statement was for you.

1 = Not at all true
2 = Slightly true
3 = Somewhat true
4 = Very true
5 = Extremely true

1. I "blanked out" or "spaced out" or in some way felt that I was not part of what was going on.

2. Things seemed to be happening in slow motion (very slowly).

3. What was happening didn't seem real, like I was in a dream or watching a movie.

4. I felt like I was watching what was happening to me, like I was floating above the scene or watching it as an outsider (from the outside looking in).

5. I felt separate or disconnected from my body or like my body was unusually large or small (not normal size—too large or too small).

6. Things happened that I didn't notice, even though I normally would have noticed them.

7. I felt confused or couldn't make sense of what was happening.

8. There were moments when I wasn't sure about where I was or what time it was.

Received August 21, 2001
Revision received January 7, 2002
Accepted January 22, 2002
Abstract

The past century saw rapid advancements in technology, especially through the United States military. Simultaneously, rates of posttraumatic stress symptoms and other combat-related disorders are rising. However, little has been published in any discipline relating the changes in technology to the changes in rates of posttraumatic stress reactions. Because of the lack of research exploring whether there is a link between specific technological advancements and soldiers’ reactions to combat trauma, my thesis provides one of the first systematic examinations of ways specific technologies used in warfare affect whether and how soldiers develop posttraumatic stress disorders. It draws on existing psychological research and theories and develops a series of hypotheses evaluating the links between specific technologies and long-term effects on soldiers’ reactions to combat trauma. Chapter Two discusses technological advancements/research from military analysts, historians, and philosophers, and it also discusses psychological research involved in the military, about soldiers, and about psychological trauma. This provides a foundation and context from which Chapters Three and Four discuss the psychological effects of specific technologies and hypothesize how they affect risk factors associated with developing posttraumatic stress disorder. Chapter Three discusses simulation technologies, the main technology used before combat, and hypothesizes that simulation technologies simultaneously increase the likelihood of reflexively killing in combat and experiencing peritraumatic dissociation and increase the likelihood of perceiving higher levels of control during combat. Chapter Four discusses technologies in warfare that manipulate actual and perceived distance (night
vision goggles, aircraft, UAVs) and are involved in weapons systems (systems approach). It hypothesizes that new technologies in war are increasing perceived psychological distance (including dehumanization), which dissipate over time. It also hypothesizes that dehumanization dissipates as cognitive empathy and guilt increase over time (risk factors for PTSD). Chapter Four further hypothesizes that weapons systems increase diffusion of responsibility and psychological distance, which have implications for perceptions of responsibility/guilt and the changing face of understanding trauma. These hypotheses are important because they will expand the understanding of risk and protective factors to include implemented military technology. Knowing this will help us develop better preparation and treatment for soldiers prior to, during, and after combat. It will also point out faults in technology used by soldiers that could increase their risk for developing posttraumatic stress disorder. Redesigning this technology will help the military not just focus on producing effective soldiers, but also more effectively support the mental health of soldiers in the future, particularly as technology becomes even more pervasive in soldiers’ lives.