UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

LEADING A MORE EFFECTIVE INTELLIGENCE COMMUNITY: UNDERSTANDING AND MANAGING THE COGNITIVE CHALLENGES OF HUMAN INTELLIGENCE COLLECTION IN LETHAL ENVIRONMENTS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

Degree of

DOCTOR OF PHILOSOPHY

By

JOHN J. HESLEN
Norman, Oklahoma
2016

LEADING A MORE EFFECTIVE INTELLIGENCE COMMUNITY:
UNDERSTANDING AND MANAGING THE COGNITIVE CHALLENGES OF
HUMAN INTELLIGENCE COLLECTION IN LETHAL ENVIRONMENTS

A DISSERTATION APPROVED FOR THE
GRADUATE COLLEGE

BY

_____
Dr. Kirby Gilliland, Chair

_____
Dr. Kelly Damphousse

_____
Dr. Trent Gabert

_____
Dr. Eugenia Cox-Fuenzalida

_____
Dr. Lori Snyder

Acknowledgements

I would like to express my sincere gratitude to my major professor, Dr. Kirby Gilliland, for his mentorship, unwavering support, and interminable patience. You are truly a gentleman scholar.

I would also like to thank Dean Kelly Damphousse, Dr. Eugenia Cox-Fuenzalida, Dr. Trent Gabert, and Dr. Lori Snyder for their support and guidance as committee members. Additionally, I would like to thank Dr. Susan Sharp, Dr. Andrea Vincent and Dr. Karen Thurston for lending me their invaluable recommendations and insights.

Finally, I would like to thank my wife, Angie, and three children, Miles, Lulu, and Lila. I couldn't have done this without your support and loving encouragement. You make it all worthwhile. Thank you!

Table of Contents

List of Figures

Abstract

The purpose of this research was to gain a better understanding of how specific aspects of cognitive performance are influenced by operating in lethal environments with the aim of incorporating any helpful insights into the operations performed by human intelligence collectors. Gaining a better understanding of any negative cognitive effects could enable leaders in the intelligence community to take mediating action resulting in a more efficient enterprise. Simulating the cognitive processes expected to be at play in lethal environments was accomplished by utilizing a technique known as mortality salience that has been shown to induce specific psycho-social reactions in individuals. Cognitive performance was tested by using the simple reaction time, attentional switching, and Stroop tests of the Automated Neuropsychological Assessment Metrics (ANAM4^{TM}). Memory recall was tested by asking participants to recall categorized items after watching a video of a fictional intelligence source. This study found mortality salience had a statistically-significant influence on certain aspects of executive function as well as memory recall and suggest the etiology of mortality salience effects are most consistent with modern understandings of cognitive bias. As such, the term "mortality bias" is proposed for future investigations and explanations of the phenomenon.

Leading a More Effective Intelligence Community

The U.S. Intelligence Community (IC), an organization composed of over 100,000 people across seventeen federal agencies, with an operating budget in FY 2012 of nearly 54 billion USD, is a unique and complex enterprise of enormous importance (Director of National Intelligence, 2012). Much of the work conducted within the IC is of a highly cognitive nature performed by personnel who have undergone unique training as intelligence collectors and analysts. In many instances these personnel are required to work in extremely challenging, and potentially lethal, environments, while still collecting and analyzing information with the utmost accuracy. Producing precise and unbiased intelligence is vital as, in many cases, it is filtered into finished intelligence products for subsequent distribution to our nation's leaders. Depending on the relevance, these finished intelligence products can be briefed to the president, Congress, or senior military personnel, who use it to formulate important decisions essential to maintaining the national security of our country.

Because the mission of the intelligence community is to present accurate assessments of the various tactical and strategic situations facing our country, it is important that senior IC leaders fully understand any potential cognitive distortions influencing its workforce and develop and implement mitigating training regimes and/or corrective policy initiatives to address them. With that in mind, the purpose of this dissertation was to investigate the effects of induced death awareness, generally referred to as mortality salience (MS), on certain cognitive or neuropsychological processes important to the intelligence-gathering process. Additionally, given mortality may be an overriding concern in many intelligence-gathering operations, it is vital that IC

leaders know and understand how MS may influence both the process and individuals involved. More specifically, this project explored MS induction effects on cognitive performance, to include attentional shifting, simple reaction time, and memory recall performance. These are all important aspects of cognitive functioning critical to intelligence gathering.

Mortality salience (MS), also known as death awareness, is a technique used almost exclusively by Terror Management Theory (TMT) researchers. These researchers have historically used MS induction to initiate cognitive phenomena known to mediate cultural attitudes in those induced. However, because MS is known to mediate elements of cognition, as well as being an obvious fact of life for personnel serving in combat zones, understanding more details of its potential effects on intelligence collectors is important. Additionally, exploring the effects of mortality salience on individuals, and extrapolating these effects to intelligence collectors operating in lethal environments, could enable intelligence community leaders to more efficiently employ their workforce and potentially improve the overall interpretation and accuracy of tactical and strategic intelligence assessments.

While MS provides an intriguing method for exploring some of the cognitive dynamics in lethal environments, the theoretical origins of MS within TMT have been called into question (see Kirkpatrick & David Navarrete, 2006). Therefore this study will look closely at alternative theoretical foundations for MS. As preliminary experiments have shown, MS produces reactions similar to those found in individuals with state anxiety (Gauthier, 2011). The expectation that MS would inhibit attentional processes could be more effectively predicted by modern anxiety-based theories of

cognitive functioning such as attentional control theory (M. Eysenck et al., 2007). Attentional control theory asserts that anxiety generally impairs processing efficiency on cognitive tasks; therefore, it is logical to assume MS would negatively influence processing efficiency as measured by common tests of executive function, such as simple reaction time and cognitive switching ability.

Furthermore, according to a meta-analysis conducted on the role of anxiety and threatening stimuli on memory bias (Mitte, 2008) higher anxious persons have an increased ability to recall personally threatening material. Because human memory storage for information is limited, the findings by Mitte suggest that in situations involving personal threat, intelligence collectors may well have a memory bias toward information relevant to their own personal safety, versus information that may have greater strategic importance to senior military leaders. For instance, consider a human intelligence source located in a remote Afghan village, where lethal IED attacks are common. If the source divulges tactical information to intelligence collectors concerning the likely location of roadside IEDs, as well as information concerning enemy re-supply routes from Pakistan (which would be information more relevant to higher-echelon strategic planners) it is likely, based on Mitte's findings, the collectors would exhibit a greater recall of the IED information because of its relevance to their own immediate safety. The obvious and potential problem arises if intelligence collectors are better able to retain information more relevant to securing their safe passage back to their forward operating base at the expense of their ability to recall strategic information more important for answering national or theater-level intelligence collection requirements, for which they were originally dispatched to acquire. If this is

indeed the case, a better understanding of these cognitive influences, which would essentially amount to a mortality bias[1], could lead to mitigating procedures being implemented in environments where MS or death awareness is generally expected to be salient.

Literature Review

Terror management theory and mortality salience. Terror Management Theory (TMT) is an experimental existential-psychological theory that seeks to explain overarching aspects of human motivation. The theory asserts, during the course of evolution, humans reached a point of cognitive sophistication and self-awareness that eventually propelled them to contemplate the inevitable fact of their own mortality, subsequently causing extreme and paralyzing psychological terror (Greenberg, Pyszcynski, & Solomon, 1986). This terror essentially proved so maladaptive to survival, humans developed psychological coping mechanisms that enabled them to "manage" its paralyzing effects. These coping mechanisms are referred to as "cultural anxiety buffers," and are constructed of two main components (Rosenblatt, Greenberg, Solomon, Pyszczynski, & Lyon, 1989).

The first component of the cultural anxiety buffer addresses a need to blanket oneself in a cultural worldview in the belief that doing so better enables one to outlive their biological body and gain some degree of symbolic immortality (Solomon, Greenberg & Pyszczynski, 2004). These worldviews can generally be thought of as

[1] Based on the theoretical assertions by Haselton et al. (2007) whereby they conclude that cognitive biases are adaptive from an evolutionary standpoint, a mortality bias would seem to have been extraordinarily helpful to humans in an ancestral environment by helping distance out-group members from access to valuable and scarce resources or by subconsciously increasing in-group coalitional activity in an attempt to mitigate potentially lethal threats.

overarching cultural paradigms, such as "Catholic," "Jewish," "Communist," "American," "Asian," or "Conservative," among others, to include all the standards and values associated with them. The originators of TMT asserted that fusing with a cultural tradition provided individuals a degree of psychological succor by allowing them the ability to live as long as their tradition endured. They also proposed accumulating great wealth, or building vast monuments to one's life, would be possible approaches one could use to further increase the likelihood of symbolic immortality, especially in the event a specific organized religion or believe system, offering an immortal afterlife, was either insufficient or unavailable (Solomon et al., 2004).[2]

The second component of the cultural anxiety buffer deals with the extent to which individuals believe they are meeting the standards of their inculcated paradigm, as measured by the concept of self-esteem. In other words, a high self-esteem is generally indicative of an individual's success in meeting the implicit and explicit tenets of their cultural paradigm, and, according to TMT, a sign one is on the correct path to successfully fusing with their paradigm and gaining immortality along with it.[3] For TMT, "…self-esteem consists of the belief that one is a person of value in a world of meaning, and the primary function of self-esteem is to buffer anxiety, especially anxiety engendered by the uniquely human awareness of death" (Solomon et al., 2004).

[2] Most researchers of evolutionary sexual selection theory would argue that attempts to accumulate vast wealth or build monuments (especially by men) are essentially only efforts to signal their biological fitness to potential mates.

[3] It should be noted that a high self-esteem as described in TMT is different than the concept of "resilience" currently used by the US Army to train soldiers to manage stress resulting from situations involving combat or deployment. Whereas self-esteem in TMT relates to how well a person is successfully inculcating the tenets of their worldview, resilience refers to the ability to operate under stressful situations and quickly recover after stressful episodes and resume to a normative behavioral baseline.

TMT researchers have relied heavily on the concept of mortality salience (MS) to test their ideas concerning the aforementioned cultural anxiety buffers. MS is a psychological technique used in TMT clinical research to prime individuals with death awareness. In general, inducing an individual with mortality salience increases their propensity to ascribe positive evaluations toward their own worldview, as well as others possessing a similar cultural paradigm. Conversely, it generally increases their propensity to have negative reactions toward dissimilar worldviews, or those associated with them, (Greenberg, Pyszczynski, Solomon, Rosenblatt, Veeder, Kirkland, & Lyon, 1990).

Priming individuals with death awareness has provided TMT researchers a tool with which to test major tenets of their theory. One such tenet includes the notion that death awareness is so mal-adaptive to human cognitive functioning, the brain evolved mechanisms to mitigate the "terror" it hypothetically produces. TMT asserts the mind's mitigation efforts work consciously, through proximal defenses, and subconsciously, through cognitive operations known as distal defenses. Conscious proximal defenses involve rationalizing instances of MS and are manifest by efforts to deny any vulnerability to death. However, the automatic transfer of death awareness into the subconscious mind where distal defenses can operate is also hypothesized. According to the theory, distal defenses work by bolstering one's self-esteem or cultural worldview, or by influencing the individual to denigrate the cultural worldviews of out-groups (Pyszcznski, Greenberg, & Solomon, 1999).

During MS induction experiments, researchers have generally found, immediately after MS induction, subjects must be given a quick distraction exercise

such as a crossword puzzle, in order for the mediating effects of distal MS to manifest (Burke, Martens & Faucher, 2010). TMT theorists explain, without the distraction exercise, death awareness stays in one's focal consciousness where, again, proximal defenses work to dismiss or rationalize the exposure. Distraction exercises, according to TMT, allow the salience of one's mortality to bypass proximal defenses and enter into the subconscious where distal defenses are initiated.

In lieu of TMT: Coalition psychology and evolutionary leadership theory. In the last decade, criticism of TMT and its particular use of evolutionary theory has steadily grown. Researchers Lee Kirkpatrick and Carlos David Navarrete (2006) published one of the first critiques of TMT's theoretical foundations by advancing a cogent argument that highlighted several inconsistencies inherent in its use of evolutionary theory. Specifically, the authors took exception to TMT's reliance on the idea of an evolved "survival instinct" being an inherent part of human nature. They pointed out that the survival instinct is a notion that was largely disavowed by Hamilton's theory of inclusive fitness, which takes into account both human and other species' engagement in altruism as a means to more efficiently guarantee an individual's transmission of genes to subsequent generations (Kirkpatrick & Navarrete, 2006).

In addition, Kirkpatrick & Navarrete highlighted the fact that an incapacitating fear of death could not possibly have been a result of evolution because it would likely never have been adaptive in the first place. Further, even in the event that a fear of death might have been an adaptive trait before becoming maladaptive, it is highly unlikely that humans would have evolved a corresponding psychological death terror

mitigation system in order to neutralize any paralyzing death terror. To put it more simply, natural selection would have likely selected out those humans who experienced paralyzing terror and favored those who did not. There would have been no need for an alternative psychological system to evolve in order to replace one that had become maladaptive (Kirkpatrick & Navarrete, 2006).

In lieu of a psychological theory (i.e. TMT) requiring either world-view buffering or anxiety-reducing reactions to MS, Kirkpatrick and Navarrete (2006) proposed a more parsimonious explanation for the effects of death awareness, which they refer to as "coalitional psychology." Coalitional psychology comprises the study of an adapted series of behaviors that the authors propose would have been beneficial to humans facing putative threats in their ancestral environment, including attacks from wild animals or rival bands, epidemic illness and famine.

Coalition psychology proposes that the enormous benefits derived from coordinated social actions among individuals in groups, especially with regard to responses to crisis situations, would have likely led the process of evolution to favor individuals with psychological traits beneficial to coalition formation and allegiance maintenance. Therefore, given the above discussion, coalition psychology more precisely explains the effects of mortality salience as a set of adapted responses to potentially lethal threats. These responses increase the cohesiveness among group members, while at the same time, increasing the likelihood out-group members will be identified through any distinct physical or cultural differences they may possess (Kirkpatrick & Navarrete, 2006).[4]

[4] Mark Pagel, in his book, *Wired for Culture: Origins of the Human Social Mind*, is also supportive of this line of thought noting that the development of culture essentially served/s as a biological strategy that

Navarrete et al. (2004) also provide an alternative explanation for the role of self-esteem in moderating the effects of MS induction, which is seemingly more consistent with the tenets of modern evolutionary thought. For instance, TMT posits that individuals with high self-esteem respond less to MS induction than do individuals with low self-esteem because high self-esteem essentially acts as a barometer for how well an individual has fused his identity with his prevailing cultural milieu. Coalition psychology, on the other hand, argues that self-esteem buffers against the effects of MS because it is indicative of the likelihood of support an individual can expect to receive from his in-group. In other words, the likelihood of coalition support is directly correlated with one's self-esteem.

Interestingly, coalition psychology has also been applied to the study of political science, especially with regard to international relations (Lopez, McDermott & Petersen, 2011). Researchers have been able to take the ideas found in coalitional psychology and apply them, at a macro level, to the operations of nation-states (Lopez et al., 2011). Thus, issues usually studied at the small group level, such as coalition formation and maintenance, resource allocation, group status and hierarchy, are, according to some international relations researchers, also applicable in explaining behavior at the nation-state level.

Another theoretical approach with tenets very similar to those found in coalition psychology and, by extension, also offering a more parsimonious explanation for the

---

enabled/s humans to pass down important knowledge concerning the most efficient way to survive in a given environment, thus increasing the odds their genes will survive into the next generation. He also theorizes that cultural differentiation, to include the development of unique languages, was helpful to ancestral humans in that it helped sustain group cohesion by controlling the input of unwanted or potentially unhelpful cultural impetuses from outside cultures.

effects of mortality salience, is "evolutionary leadership theory" (van Vugt & Ahuga, 2011). Evolutionary leadership theory (ELT) approaches the study of leadership from a perspective incorporating the tenets of evolutionary psychology, which asserts humans evolved as group-living social animals. Given that humans are social animals acculturated by group living, ELT proposes both leadership and followership had to develop in order to allow human groupings to efficiently make choices involving life and death, and not deteriorate as a result of constant inter-personal conflict.

Seemingly simple matters, such as which direction to move in order to find water or avoid an external threat in the ancestral environment, would easily have doomed a human group if not for the obvious existence of leadership and followership roles in human groups (Van Vugt, Hogan & Kaiser, 2008). ELT assumes well-led groups in the ancestral environment that could efficiently move, find food and water, and act in unison against external threats, would be more effective and adaptive than groups riddled with conflict and ambiguity over who should lead and who should follow.[5] Therefore, ELT is interested in exploring the mechanics of how this coordination between individuals in groups is negotiated in various social modalities.[6]

ELT takes a very broad and comprehensive view of leadership in that it incorporates diverse disciplines such as biology, anthropology, neuroscience,

[5] The anthropologist, Christopher Boehm, in his book, *Hierarchy in the Forest: The Evolution of Egalitarian Behavior*, notes that most of the indigenous hunter-gatherer societies that have been studied were highly egalitarian. In these societies, leadership was often fluid, depending on the task at hand, and any overt posturing by an individual in order to gain an advantage was quickly (and usually harshly) met with resistance from the rest of the group. Boehm called this tendency of the weak to keep the strong in check, a "reverse dominance hierarchy," and strongly undermines the traditional notion of a unitary alpha male being the evolutionary adaptive model of leadership.

[6] Interestingly, research cited by Goleman, et al. (2002) in their book, "Primal Leadership", notes the existence of contagious emotions that occur between humans in close groups. These contagious emotions, resulting from the "open-loop limbic system," would also have been very helpful in coordinating group action during both crises and pro-social activity.

psychology and organizational behavior, among others. Given the complexity of human behavior and varieties of human social and cultural environments, ELT researchers understand it takes a multi-disciplinary approach to illuminate and describe the various processes involved in human leadership. ELT also relies on these diverse disciplines to help put into perspective how human behavior is affected by our ancestral past.

For instance, the use of the Big Five personality test (Costa & McCrae, 1992) shows that extraversion is strongly related to leadership potential (Judge, Bono, Ilies, & Gerhardt, 2002). ELT research has shown that those first to act in situations are generally thought of as leaders, and extraversion is generally a trait correlated with individuals who move first in coordination games (van Vugt, 2006). Previous leadership research has also revealed tall individuals are more likely to assume leadership positions, a phenomenon explained by ELT resulting from the natural inclination of individuals in ancestral environments to look toward taller persons to referee inter-group conflict or intimidate potential attackers (Van Vugt, Hogan & Kaiser, 2008).[7]

Interestingly, ELT deals briefly with the concept of MS when explaining the results of a study that showed individuals preferred a "visionary," versus a "doer" or "peacemaker," after MS manipulation. ELT theorists explain that, because MS induces

[7] In support of this analysis, researchers at the University of Utah found that taller individuals, by virtue of the increased downward angle they can produce, are generally able to execute a punch with greater force than those less vertically inclined. This would, obviously, give taller men an advantage in physical altercations and the ability to provide security. These attributes, the researchers surmise, may partly explain females' general preference for taller men (Carrier, 2011). In a more recent study, the Utah researchers found evidence that faces of humans may have actually evolved to better absorb punches from rivals, as evidenced by the robustness in facial areas most susceptible to receiving blows (Carrier & Morgan, 2014).

a sort of mortal dread in individuals, they instinctively retreat back to innate responses, honed in the ancestral environment where protection from the most trusted person (the visionary) would be the most prudent choice to secure one's safety (van Vugt & Ahuga, 2011).

It should also be noted the originators of ELT, when addressing the study using MS and leadership styles, did not in any way validate the claims of TMT or its psychoanalytic explanations regarding the cognitive mediations MS induces. Instead, they simply provided an explanation that is totally consistent with modern evolutionary theory, on which both ELT and Coalitional psychology are based.

Recall that TMT also asserts the need for distraction exercises in order for MS effects to manifest. Neither coalitional psychology or ELT researchers offer an explanation for this phenomenon; however, the work of Stanovich and West (2000) may provide an intriguing alternative. Stanovich and West posit that we have mental operations categorized as "system 1" and "system 2." This idea of a dual-processing cognitive system was later popularized by Nobel Laureate psychologist Daniel Kahneman in his book, *Thinking Fast and Slow* (2011) and seems to offer a more parsimonious explanation for the effects of MS versus the proximal and distal operations cited by TMT theorists. Kahneman described System 1 as a cognitive system that automatically and constantly updates one's interpretation of environmental reality and is characterized by, among other things, associative thinking. System 2, in contrast, is a more goal-directed cognitive system in that it involves the purposeful allocation of attention to various mental activities, to include the purposeful or logical analysis of one's environmental reality. Although the cognitive machinations involved

with System 1 are believed to be shared with many other animals, it is believed the suite of cognitive abilities associated with System 2 have only recently evolved with Homo sapiens (Stanovich & West, 2000). Given this explanation, it is likely that the need for a distraction exercise after MS represents the need for death awareness to be moved from System 2 operations, where logical analysis of one's environment takes place, into System 1, where automatic mental heuristics are initiated in response to environmental prompts or stimuli. In this case, MS likely represents a potentially mortal environmental stimulus, and reactions to it, such as coalescing more strongly with one's in-group, or disparaging an out-group, are representative of an automatic mental heuristic typical of a System 1 response.

Decoupling mortality salience from TMT. As previously mentioned, criticism of TMT by social science researchers has steadily grown, many of them citing logical inconsistencies inherent in its theoretical foundations. These criticisms generally, but not exclusively, focus on TMT's perceived misuse of evolutionary theory. And, as noted above, there are researchers who have offered more parsimonious explanations for the effects of MS, grounding the resulting phenomenon more firmly in modern evolutionary theory. A more secure grounding in evolutionary theory would be extremely beneficial because it would give the phenomenon greater predictive and explanatory force. It would also allow MS to be used in cross-disciplinary research and academic endeavors not necessarily adhering to the tenets of analytic psychology. Given these circumstances, it seems logical that both the concept and phenomenon of MS should be decoupled from TMT's exclusive jurisdiction and freed for use with other academic theories and disciplines.

For instance, from a scientific research point of view, it would seem more useful if MS was available to study a variety of environments where mortality is generally expected to be salient, such as hospitals, emergency response sites, court rooms (i.e., the litigation of murder cases and the effects on juries), or forward operating bases in combat zones. In addition, an explanation of the effects of MS would be better suited in theories more adequately grounded in mainstream evolutionary thought, such as those found in coalition psychology or evolutionary leadership theory. Once firmly nestled in more logical foundations, MS would likely prove to be a more cogent (and widely used) tool in which to study the various modalities of cognitive functioning as mediated by the experience of working in death salient environments.[8]

Measuring the cognitive and neurological effects of mortality salience.

There have been many TMT studies showing the effects of MS on behavior, the majority showing that MS induction increases the likelihood individuals will display or communicate more favorable evaluations of their cultural worldview while giving unfavorable evaluations to those possessing dissimilar cultural worldviews. For the purpose of this study, the traditional behavioral level of analysis, explored in many prior TMT-based studies, was abandoned for a research designed more focused on how MS influences basic neurocognitive processes, particularly information recall performance, attentional switching, and neurocognitive processing speed. It is these basic abilities involving memory recall, attentional switching, and processing speed that are some of the most important regarding a human intelligence (HUMINT) collectors' ability to

[8] As a consistent theoretical approach is solidified and advanced, mortality salience research may lend itself to a vast array of disciplines not immediately understood as having relevance. For instance, it is logical to assume continued MS would mediate the economic development of areas where tribal or ethnic violence is ubiquitous, in that security and defense-related concerns would likely take precedence over concerns relating to human capital development.

quickly and efficiently perform their duties while deployed in a military combat zone. Further, by decoupling MS from TMT and focusing on basic neurocognitive functions, alternative schemas for MS can be operationalized. If MS can be freed from the intellectual bounds of TMT, the dynamics of MS may be seen as better paralleling the generalized dynamics of anxiety. Given there is robust research indicating anxiety biases attention much in the same way as MS, i.e., toward threat-related information (M. Eysenck et al., 2007), it is logical to assume MS-induced student participants would remember threatening-related information to a greater degree than neutral information.

Attentional control theory. One of the more contemporary and promising theories addressing the effects of anxiety on cognition is Attentional Control Theory (M. Eysenck et al., 2007). Attentional control theory (ACT) is an extension of Eysenck and Calvo's (1992) processing efficiency theory. Updated with several new theoretical propositions, ACT includes the concepts of attentional effectiveness and efficiency.

Attentional effectiveness addresses the quality of one's attentional task performance, as measured by a number of cognitive tests. *Efficiency* refers to the relationship between the quality of attentional performance and the amount of cognitive effort required to maintain that quality, and, for the purposes of this research project, is the concept of which I will be mostly concerned. With regard to understanding processing efficiency, a crude analogy would be two identical vehicles, one being perfectly tuned, the other operating with dirty filters and old sparkplugs. Obviously, if both were traveling the same distance at the same speed, the highly tuned vehicle would require less gas because it would be operating much more efficiently than the un-tuned vehicle, as the dirty filters and old sparkplugs would place an additional load on the

engine. Similarly, one's attentional system can operate more efficiently if performance is not hindered by added demands, such as anxiety, fatigue, distraction, etc.

As ACT is concerned with the effects of anxiety on processing efficiency, it should be noted the theory utilizes Power and Dalgleish's (1997) view that anxiety is caused when the attainment of a current goal is threatened. Eysenck et al. (2007) also assume, if a goal is threatened, anxiety is facilitative in initiating one's environmental scanning protocol in order to determine who or what is responsible for posing the threat. Therefore, according to ACT, anxious individuals would deploy a greater degree of their attentional resources towards scanning the environment for threat-related stimuli. A person engaged in a particular task, who also becomes anxious as a result of a subsequent threat, may not show any decrease in their attentional effectiveness while performing their original activity. However, given the additional cognitive resources needed to sustain their attentional effectiveness on the task, it is likely their attentional efficiency would be decreased. In other words, an environmental threat may not necessarily decrease the effectiveness of attentional performance; however, the additional cognitive resources deployed to determine the nature of the threat, likely leads to degradation in the efficiency of the attentional system.

Operationally, ACT researchers have used various instruments to assess the attentional system (M. Eysenck et al., 2007). Notably among them is the Stroop test, which evaluates processing speed, selective attention, interference, and executive functioning. Similarly, switching tasks have also been used to assess the fundamental neurocognitive functioning of a person to allocate resources back and forth between tasks, a process that can be vulnerable to added interference, such as evoked anxiety.

It should also be pointed out that ACT assumes an attentional system comprised of both a "top-down," goal-directed attentional system, and a "bottom up," stimulus-driven attentional system, as described by Corbett and Shulman (2002). The goal-directed system is influenced by one's expectations, experience, and goals, while the stimulus-driven attentional system is propelled by stimuli that are salient and/or potentially threatening. ACT asserts that anxiety disrupts the equilibrium between the stimulus-driven and goal-directed attentional systems. It does this by increasing the influence of the stimulus-driven system, which is mobilized to detect and process threat-related stimuli in the environment, a zero-sum process that operates to the detriment of the goal-directed system. This characterization of the attentional system is important in understanding why ACT hypothesizes that anxiety impairs processing efficiency on tasks involving the inhibition function, especially those involving threat-related stimuli.

Given the above discussion, the purpose of this study was to explore how MS mediates key aspects of neurocognitive functioning and behavior relevant to a human intelligence collector's ability to operate in lethal environments. In addition to the evidence suggesting MS influences cognition in a manner similar to anxiety (Gauthier, 2011) and in conjunction with the evidence suggesting this influence appears to lead to selective attention toward information relevant to self-survival, it is possible that anxiety may compromise a HUMINT collector's ability to fully perceive and remember vital information regarding strategic enemy characteristics. Therefore, because the effects of anxiety on attentional control can be measured by tests assessing inhibitory function , attentional switching, as well as instruments assessing attentional bias, i.e., recall (M. Eysenck et al., 2007), the expectation was that it would be possible to use

these tests to assess the influence of MS on HUMINT collectors' neurocognitive functioning. With these assumptions in mind, the major research questions in this study were: 1) What effect does MS have on inhibitory function, as measured by the Stroop test? 2) What effect does MS have on attentional switching? 3) What effect does MS have on simple reaction time? 4) What effect does MS have on memory recall of intelligence information when personally-threatening, strategic and neutral modalities of information are presented verbally? All four of the previous questions were explored using a between-subjects experimental design, and it was predicted that MS induction would negatively influence one's inhibitory efficiency, degrade one's ability to switch attention, degrade simple reaction time, and increase one's attentional bias to personally-threatening material, thus increasing the memory recall performance of information deemed most important for one's immediate survival.

Methodology

Participants

A total of 107 students (73 female) from a major Midwestern research university participated in this study. Data from 12 students was discarded due to technical errors during data collection. Students ranged in age from 18-25 (M=19.5, SD=1.18) and all were enrolled in introductory psychology courses. Participants were recruited from the psychology department's subject pool and were allotted research participation hours or extra credit for their participation. All volunteer student participants had the option of alternative activities to gain extra credit or doing no extra credit options, if they so chose.

Materials

For this study, the "simple reaction time," "switching" and "Stroop" subtests of the Automated Neuropsychological Assessment Metrics (ANAM4™) were utilized, as well as a memory recall instrument that incorporated an intelligence gathering scenario, specifically designed to explore MS's influence on attentional bias. ANAM4™ is a computer-based neuropsychological assessment tool that can measure various cognitive functions, such as reaction time, attention, and general cognitive ability. Each computer-based test can be rapidly administered and includes a "practice mode" to ensure participants understand the test. The "practice mode" is followed by a "test mode" in which the actual recorded test data trials are administered. It is also a very germane instrument for research with applicability to the military community, given it was initially designed to be used with the military and was subsequently employed to test military-relevant topics such as cognitive baseline performance prior to deployment (Vincent et al., 2012), traumatic brain injury (Warden et al., 2001), environmental toxin exposure (Kane et al., 1996) and stressful environments (Harris et al., 2005).

The simple reaction time (SRT) test of the ANAM4^{TM} is considered one of the most fundamental human performance measures and is quick and easy to administer. Simple reaction time is measured by having participants respond to the presence of an asterisk "*" on their computer screen as quickly as they can, by pressing a button on their computer mouse. The dependent measure used for analysis was reaction time (RT) in milliseconds. Previous research exploring anxiety's effects on SRT have been mixed. (Faber & Spence, 1956) found no effects from anxiety on SRT, while (Nishisato, 1966) found trait anxiety did increase SRT.

Following the work of Eysenck et al. (2007), there is much evidence indicating anxiety impairs processing efficiency as well as, in many cases, performance effectiveness on tasks involving the shifting (switching) function. Prior research by Miyake et al (2000) determined that the Wisconsin Card Sorting Task (WCST) is a reliable instrument to test the shifting function of the central executive. However, I used the "switching" subtest of the ANAM4^{TM}, as it is automated, takes far less time to administer, and has been shown to correlate highly with the WCST (Faneros, 2014).

The "switching" subtest of the ANAM4™ is a computerized instrument consisting of the ANAM4™ "manikin test" and the "mathematical processing test." The "manikin test" is used to assess spatial-rotation ability by asking subjects to state in which hand (left or right) a computerized manikin is holding a ball. The math test includes simple addition or subtraction problem. Subjects were presented with a screen showing one test at a time, and at random periods, would shift from one test to the other. The dependent measure used for analysis in this task was the "throughput," which measures the number of correct responses divided by the response time in minutes.

The "Stroop" subtest of the ANAM4™ measures processing speed, selective attention, interference, and executive function. The test assesses these functions by presenting participants with a series of black blocks on a computer screen. The blocks will generally consist of the names of a color, such as "red", "green", and "blue", but spelled in a font of a different color. Having participants indicate which color is spelled, versus the color of the font in which it is written, gives a measure of their ability to inhibit prepotent responses. The dependent measure used for analysis was the

"Subset Level 3 Interference Score," which is the typical outcome score used for the Stroop and captures the number of items correct minus the "PredCWScore."

Finally, following a meta-analysis performed by Mitte (2008) there is a robust amount of research indicating higher anxious persons have a greater tendency to recall threatening material. Given this theoretical foundation, it was logical to assume an individual induced with mortality salience, would be more apt to remember information relevant to their own (personal) safety versus information considered more strategic in nature and less germane to their immediate survival or safety. With this in mind, a three-minute video was developed portraying a friendly intelligence source in military gear being recorded in what looked like a remote cave. The video contained 30 data points used to assess memory recall. Of the 30 data points, 10 were "strategic" (e.g., enemy plans, logistics and strategy) 10 were "personally-threatening" (e.g., information on aspects of the immediate environment that pose life endangering threat), and 10 were "neutral" (e.g., information that is neither personally-threatening nor strategic in nature).

Procedure

All testing took place in a psychological testing laboratory suite of rooms in a department of psychology in a large, Midwestern research university. Participants were recruited through an online experimental participant recruitment system. Participants were run in groups of two to five participants. I utilized a between-subjects experimental design and the recruited participants were randomly assigned to one of three groups: a Mortality Salience induction group (MS), a Dental Pain Salience induction group (DPS) and a non-mortality/dental pain salience induction Control group

(CTL). The DPS has been used in MS research (Burke, Martens, & Faucher, 2010) as an additional control group to assess the possible effect of a non-anxiety–producing self-referent episode having a similar effect to MS. All participants were given informed consent forms regarding the study prior to testing and told they could discontinue their participation at any time during the study for any reason.

As each group of participants arrived, they were welcomed and given a short description of the overall study and their informed consent forms. The participants were told the study in which they were agreeing to participate was designed to investigate cognitive responses during intelligence collection activity.

Prior to the session, each group was assigned, through block-randomization, to one of the three comparison groups, i.e., MS, DPS, or CTL. After each group was settled into the lab, they were induced with one of the following three protocols. The MS group was induced with mortality salience by spending 10 min writing down on paper what they believe happens to their physical body after they die, which is the most common protocol used in previous MS induction experiments (Greenberg et al., 1990). The participants assigned to the DPS group were asked to write a 10-min description of the worst dental pain they have ever experience. This is also a common control protocol for previous mortality salience research. Finally, the CTL group participants were asked to write a 10-min description of their most favorite automobile, a control technique utilized for its putative emotive neutrality. At the conclusion of the 10-min induction period, the respective MS, DTL, and CTL participants were asked to spend five min on an elementary-level cross-word puzzle, an exercise traditionally used to ensure MS is out of the focal consciousness of the MS group participants.

After completing work on the crossword puzzle for five min, respective group participants were instructed to log on to the computers at their workstations and complete the "practice mode" of the ANAM4^{TM} SRT test. When all participants noted they felt comfortable with their ability to efficiently conduct the first ANAM4^{TM} test, they were asked to complete the "test mode" of the SRT. After completing the SRT, participants either took the SWT or the STR for their second test, as dictated by a randomization schedule. Following the second ANAM4^{TM} test, participants were led into a darkened room where the video portion of the HUMINT Recall Test was shown. The video lasted approximately three min. After watching the video portion of the HUMINT Recall Test, and before being instructed to recall any data from the video, participant groups were led back into the main testing room and asked to complete the "practice mode" of the third ANAM4^{TM} (either the SWT or STR) test followed by the "test mode" of the third ANAM4^{TM} test. After completing the third ANAM4^{TM} test, participants in the group were asked to spend five min recalling as many data-points from the HUMINT source video as possible. The delay in attempting to recall data from the video simulated the lag HUMINT collectors would likely experience between the time they procured verbal data from a clandestine source and the subsequent opportunity to inconspicuously notate it. Thus, although the SWT and STR tests were given in random order across groups, the video portion of the HUMINT Recall Test was always administered in-between the second and third ANAM^{TM} tests. The recall portion of the HUMINT Recall Test was always completed last.

Results

There were four different sets of analyses performed for this study. First, the study examined the effects of mortality salience on memory recall items. Additionally, analyses were performed on the effects of mortality salience utilizing three separate ANAM4TM performance tests: Simple Reaction Time (SRT), Attentional Switching (SWT), and Stroop (STR).

Memory Recall Test

The Memory Recall Test consisted of 30 total data points, 10 points for each of the three categories: neutral, strategic, and personally-threatening. A scoring sheet was constructed with each item being assigned a numeric value. Participant recall sheets were analyzed by two independent raters, assigned scores based on the scoring sheet, and averaged. Inter-rater reliability for the neutral item scoring was very high based on an interclass correlation coefficient at .97. Inter-rater reliability for the strategic and personally-threatening items were also high based on interclass correlation coefficients of .98.

A one-way multivariate analysis of variance (MANOVA) was conducted in order to determine if there were any statistically significant group differences between mean scores for the three treatments groups, (CTL, $N = 32$), (DPS, $N = 31$), (MS, $N = 32$) across the three dependent recall variable item types. The three recall item types included the following: neutral items (N_Score), personally-threatening items (P_Score), and strategic items, (S_Score).

The one-way MANOVA revealed a statistically significant difference exists between the three treatment groups, F (6, 180) = 2.60, $p = .019$. There does not appear to be any extreme outliers in any group (see Figure 1).

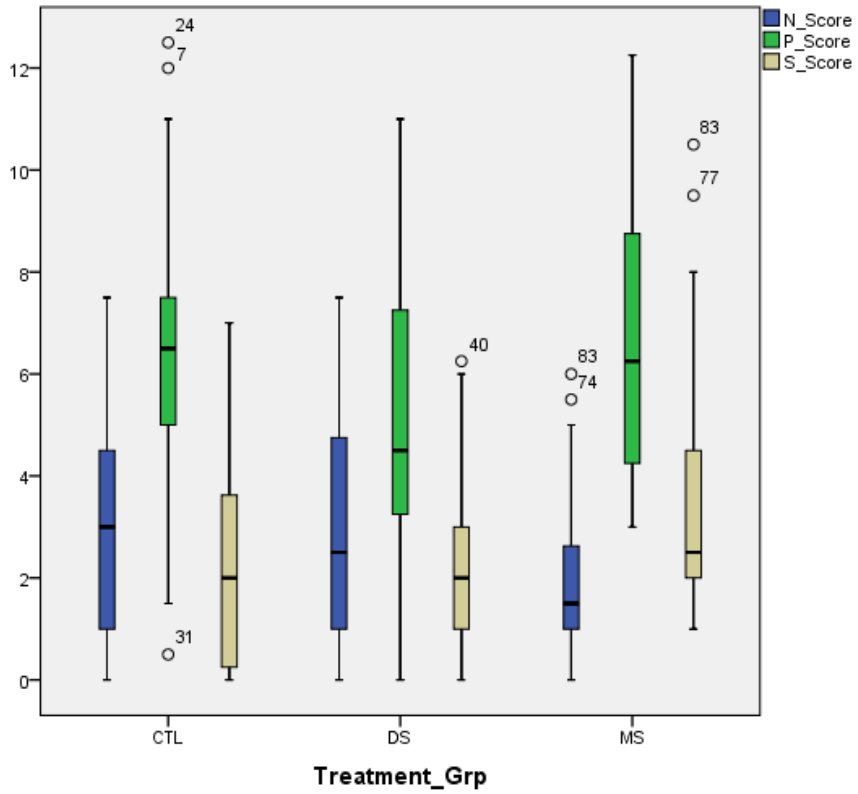

Figure 1. Shows the number of outliers in each group analyzed using a multivariate analysis of variance in order to determine any significant group differences in mean scores. Extreme outliers are denoted by an asterisk (*)

In order to determine which dependent variable was responsible for the difference in mean scores between the three treatment groups, three separate ANOVAs were conducted. The ANOVA between treatment groups of recalled neutral items was not statistically significant, F (2, 92) = 2.2, p = .114. The ANOVA between treatment groups of recalled personally-threatening items was not statistically significant, F (2, 92) = 2.28, p = .108. Finally, the ANOVA of recalled strategic items revealed a statistically significant difference between the three treatment groups, F (2, 92) = 3.74, p = .027.

A Tukey post hoc analysis was subsequently conducted and revealed the difference in mean strategic recall item scores between the CTL and MS groups to be statistically significant, (p = .048). The difference between the CTL group and DPS group was not statistically significant, (p = .998). Additionally, the difference between the DPS and MS treatment groups approached significance, but was not statistically significant (p = .057).

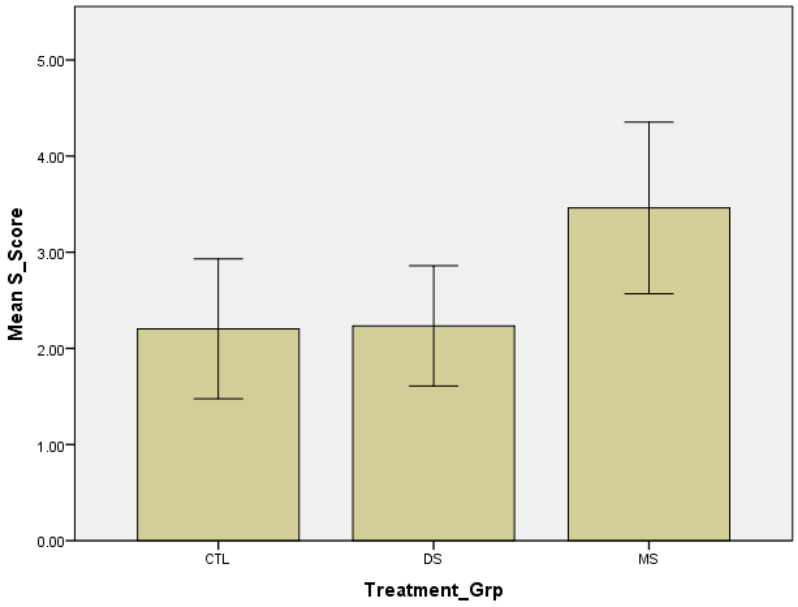

Figure 2. Shows a comparison between the mean strategic recall item scores of the CTL, DPS, and MS treatment groups.

ANAM4™ Tests

It was hypothesized that if more global measures of recall were influenced by MS, then more discrete measures of human performance or cognitive efficiency might reveal more subtle differences consistent with the literature on the disruptive effects of anxiety (see Eysenck, 2007). There were three ANAM4™ performance tests (Simple Reaction Time, Switching, and Stroop) used in order to determine if mortality salience

affected specific aspects of motor performance or cognitive efficiency. Also, because rapid and brief performance tests can produce extreme outliers, the data for the ANAM tests were assessed for outliers. The criterion for an extreme outlier was any value greater than 3 box-lengths from the edge of the box.

Simple reaction time (SRT). Simple reaction time (SRT) is one of the most fundamental human performance measures. Many believe it forms a component of most other complex responses that use increasing levels of cognition. The ANAM4^{TM} SRT test was included to determine if MS influences human performance at this more fundamental information processing level. A one-way ANOVA was employed to determine if there was a significant difference between the comparison groups. The dependent measure was reaction time, which was measured in milliseconds. Because brief performance tests often produce extreme outliers, the data for the ANAM4^{TM} was assessed for outliers. There were no extreme outliers as assessed by boxplot. SRT scores for the CTL, DPS and MS groups are presented in Figure 3. Although the MS group scores indicated longer reaction times, as predicted, the difference between the groups was not statistically significant F (2, 92) = .527, p = .592.

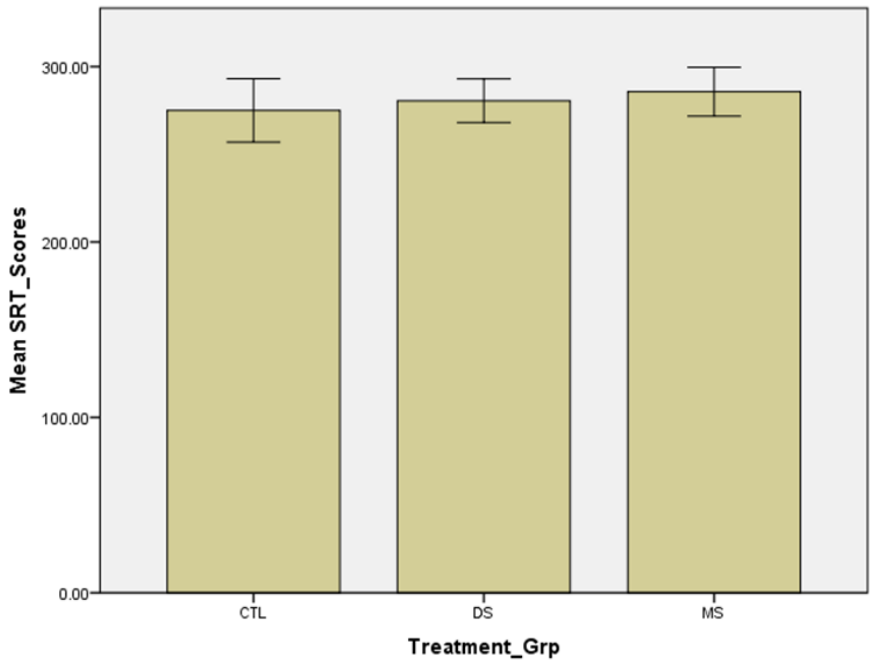

Figure 3. Shows a comparison between mean Simple Reaction Time (SRT) scores of CTL, DPS and MS treatment groups.

Attentional switching test (SWT). The switching (SWT) test was included in this study because of its ability to assess both directed attention and executive functioning. Again, a one-way ANOVA was conducted to determine if there was a significant difference between comparison groups. Like the above example, subjects were classified into 3 groups; control (CTL), dental pain salience (DPS), and mortality salience (MS). Number correct divided by min (throughput) was the dependent variable. There were no extreme outliers in any of the treatment groups, as assessed by boxplot. SWT scores increased from DS group (M = 22.7, SD = 7.2) to the CTL group (M = 23, SD = .8), to MS (M = 23.5, SD = 7.9), in that order (see Figure 4). Contrary to predictions, the mortality salience group appeared to have less interference with regard to the ability to shift attention; however, the difference between treatment groups was not statistically significant F (2, 92) = .093, p = .912.

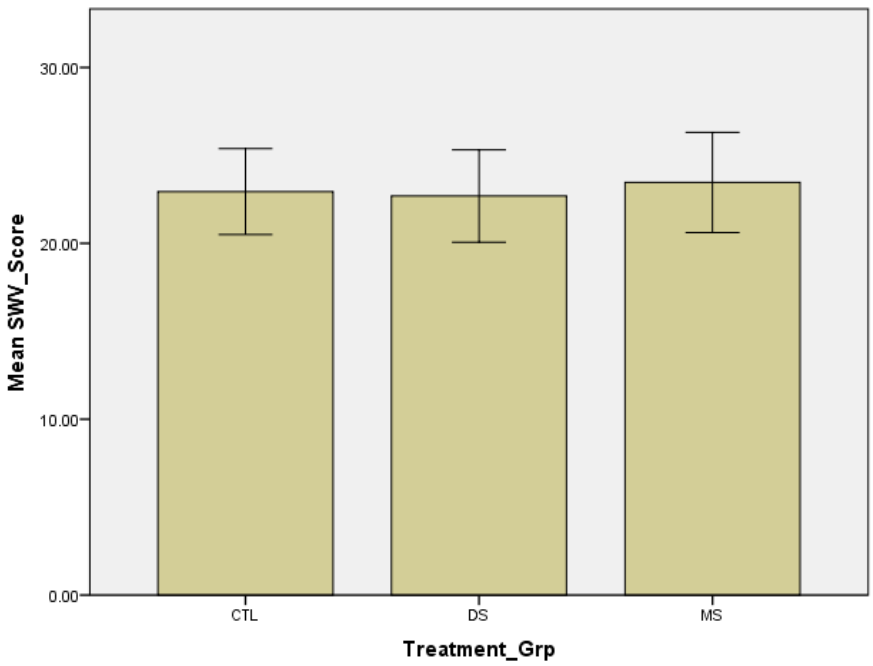

Figure 4. Shows a comparison between the means Switching (SWT) scores of the CTL, DPS and MS treatment groups.

STROOP test (STR). Finally, the Stoop Test was utilized in this study for its ability to assess processing speed, selective attention, interference, and executive functioning. A third one-way ANOVA was conducted to determine if there was a significant difference between comparison groups. Again, as in the above example, subjects were classified into 3 groups, control (CTL), dental pain salience (DPS), and mortality salience (MS), with reaction times measured in milliseconds. There was one extreme outlier in the (DPS) group that was discarded, as well as one outlier in the (MS) group. Additionally, one score in the (CTL) group was lost due to a technical error. STR scores increased from MS group (M = 16.6, SD = 7.83) to the CTL group (M = 18.72, SD = 7.72), to DS (M = 23.26, SD = 9.96), in that order (see Figure 5). The difference between the MS group and DS group was statistically significant, F (2, 89) =

3.5, p = .034. The difference between the CTL and MS group and the difference between the CTL and DPS group were not statistically significant.

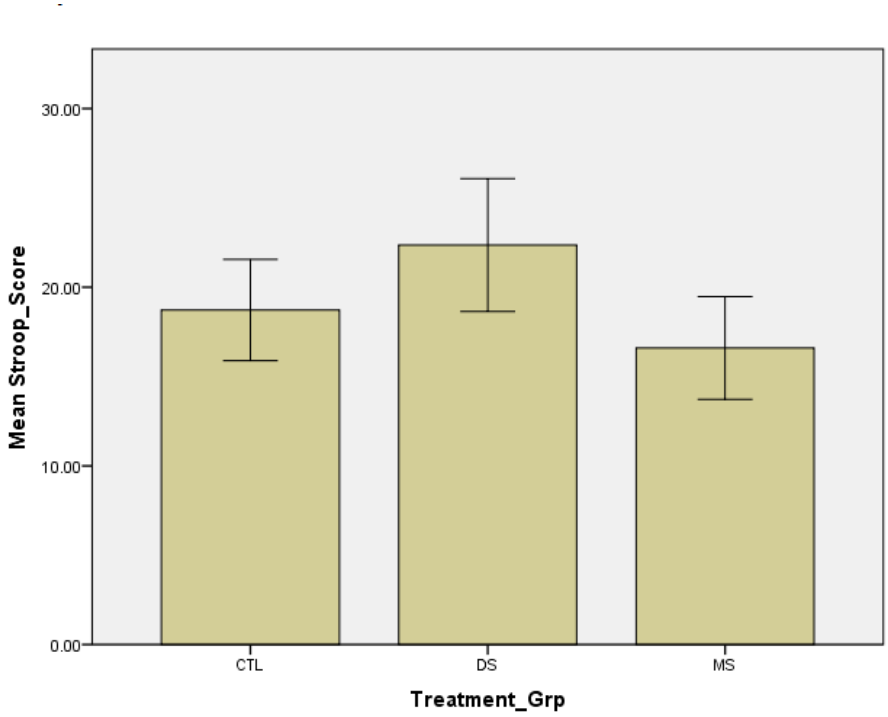

Figure 5. Shows the difference in mean Stroop (STR) scores between the CTL, DS and MS treatment groups.

DISCUSSION

The purpose of this study was to gain a greater understanding of the cognitive challenges of human intelligence collection in lethal environments. The aim was to potentially incorporate any insights from this research into organizational leadership efficiencies within the United States Intelligence Community. Simulating cognitive processes similar to those likely found while collecting intelligence in a combat zone was accomplished using mortality salience (MS), a tool generally utilized in Terror Management Theory research and known to influence specific aspects of psycho-social behavior. Given prior research has shown MS influences behavior in ways similar to

state anxiety, the expectation was MS would disrupt attentional processing as predicted by Attentional Control Theory (M. Eysenck et al., 2007). Attentional Control Theory (ACT) proposes that anxiety degrades the efficiency of attentional processing; therefore, after MS induction, it was expected these degradations could be measured using instruments designed to assess cognitive performance and memory recall skills of the same types generally utilized in intelligence gathering situations. Consistent with expectations, results indicated MS influenced cognitive performance and memory recall ability, although not quite in the direction as predicted.

MS was found to influence the ability of subjects to recall items from the mock intelligence source video to a statistically significant degree, although the influence was inconsistent with expectations in that it occurred with "strategic," not "personally-threatening" recall items. "Personally-threatening" recall items were hypothesized to be recalled at a higher rate than either "strategic" or "neutral" recall items based on a meta-analysis performed by Mitte (2008) who asserted that subjects with higher rates of anxiety tend to remember personally-threatening material at increased rates. The result in the present study that "strategic" recall items were remembered at greater rates, although unanticipated, may have several logical explanations.

First, given the majority of subjects were tested in groups, it is possible the dynamics of coalitional psychology were at play and influenced the recall of data. For instance, coalitional psychology theorizes that evolution would favor groups who better coordinate reactions to threats and crisis situations (Kirkpatrick & Navarrete, 2006); therefore, it is logical to assume these dynamics may also be in play with regard to

remembering the type of information (i.e., strategic), that would best assist in group survival.

If one assumes MS mimics the cognitive processes associated with identifying a potentially lethal threat from the environment, and remembering "strategic" threat information would best serve the overall protection and ultimate survival of the group, it is logical to assume the dynamics of coalitional psychology would support an increased ability to remember strategic modalities of information.

An additional explanation for this confounding factor in the results includes the possibility that MS supports an increased ability to remember information that is more relevant to the survival of the group and the individual, keeping in mind the ability to remember "personally-threatening" information under the MS condition approached significance (p = .057). This line of reasoning is supported by the apparent decrease in the number of "neutral" recall items recalled by the MS group, as opposed to the CTL group, although the decrease was not statistically significant (p = .114).

Examining MS effects on cognitive efficiency was performed by utilizing the Simple Reaction Time (SRT), Attentional Switching (SWT), and Stroop (STR) tests of the ANAM4^{TM}. As previously stated, ANAM4^{TM} tests were included to assess the more fundamental cognitive processes that may underlie intelligence gathering, especially those that correspond to the known effects of anxiety on attentional control. It was believed that the Attentional Control task and the Stroop task might be useful in this regard, and the SRT task was added during test protocol development because it is useful in broader terms for preparing participants for ANAM4^{TM} test performance and fundamental to so many cognitive tasks. Although no prior predictions were stated for

SRT, SRT results trended toward indications that subjects induced with MS have slower response times than either the CTL or DPS treatment groups, as would be expected.

This apparent trend toward longer response times after MS induction is consistent with the negative effects of anxiety on cognitive processing theorized by Eysenck, 2007. Given this finding, future research should investigate this effect incorporating greater statistical power obtained through utilizing a higher *N*, providing participants more extensive practice on SRT to gain more asymptotic performance and reduce variability, or perhaps use alternative tests of SRT such as choice RT where some degree of cognitive function is included. Also, in light of these results, it would be interesting to investigate mortality salience effects on auditory and olfactory efficiency to determine if MS influences perceptual abilities. This proposal stems from the assumption inherent in attentional control theory that, when an individual perceives a threat in the environment and subsequently experiences anxiety, their attentional resources are more broadly allocated, thereby increasing their chances of determining its locus.

Next, the ANAM4^{TM} attentional switching (SWT) test was used to investigate MS effects on the ability to switch attention between stimuli. There were no statistically significant differences; however, the MS group trended toward less interference than both the DPS and CTL groups. This finding was contrary to expectations given MS was predicted to interfere with cognitive performance. Many participants showed signs of tension while trying to determine the spatial orientation of the ball held by the manikins which may have influenced the results in some manner.

Finally, an examination was conducted to determine if MS influenced cognitive performance as measured by the Stoop test. The results were again unexpected, albeit interesting, in that the only statistically significant group differences were between the MS and DPS groups. The difference between the MS and CTL group was not statistically significant. However, the morphology of the differences suggests that dental pain salience (DPS) may have acted to increase cognitive efficiency, while MS, as attentional control theory suggests, interferes with cognitive processing. Future research investigating the cause of DPS influence in cognitive performance, including whether or not a distraction exercise is needed to initiate System 2 processes, would be interesting.

The results of this research indicate MS influences both memory recall and cognitive performance. Although some of the results were unexpected, they do beg for additional research in order to provide greater granularity regarding the locus of the effects. It is interesting to note that the two tests where statistically-significant results were found involved memory recall and Stroop, both of which would be expected to require more cognitive resources to negotiate than either the SWT or SRT. This finding is consistent with a major tenet of attentional control theory that asserts that anxiety decreases attentional efficiency as cognitive demands from tasks increase.

Additionally, these findings, coupled with over thirty years of TMT research showing MS influences psycho-social behavior, (although utilizing a questionable theoretical framework), provide strong support for the existence of what could be referred to as a "mortality bias (MB)." Because it is logical to assume that the human attentional system would become energized after MS (i.e., a potentially lethal threat

stimuli from the environment) in order to more quickly decipher the locus of the potential threat and increase survivability, the existence of a mortality bias would seem to increase the probability of survival. Allowing the effects of MS to be classified into more theoretically-sound schema utilizing commonly-accepted scientific nomenclature, as found in evolutionary leadership theory, evolutionary-based cognitive bias or coalitional psychology research, would give the phenomenon more explanatory and predictive force. As such, it is unlikely TMT would have a parsimonious explanation for the statistically-significant results found in this study as it traditionally is concerned with MS effects at the behavioral level. Conceptualizing the effects of MS as a mortality bias would provide a more cogent and unified explanation whether at the neurological or behavioral level.

In conclusion, additional research into the areas described above may provide valuable insight into the cognitive processes critical for intelligence collection in lethal environments. Increased insight regarding MS effects on the group dynamics (as it relates to cognitive processing) of teams collecting intelligence in combat zones may help save lives and increase the efficiency of the overall intelligence enterprise. In other words, as this project suggests, if individuals operating in teams are better able to recall strategic information in lethal environments, should they then be trained to pay greater attention to personally-threatening information? Also, further research into the disruptive effects of MS on cognitive processing, as highlighted in this project, may help temper the expectations of HUMINT leaders regarding task demands. As such, keeping operational expectations reasonable regarding intelligence collection missions

in combat zones may help prevent burnout or other decrements associated with unrealistically high cognitive loads.

Also, a more robust understanding of these processes may add insight into the evolution of human cognitive development, and, by extension, a better understanding of the human experience. Additionally, as these results are consistent with the theoretical foundations proposed in Attentional Control Theory, Coalitional Psychology, and contemporary understandings of cognitive bias, there is greater justification to decouple MS from Terror Management Theory. Once decoupled, MS could begin to be utilized as a research tool in a wide variety of cognitive and social science domains whose theoretical foundations may be more viable than those found in Terror Management Theory.

If, as Haselton et al., (2015) propose, a cognitive bias occurs when human cognitive processes "…reliably [produce] representations that are systematically distorted compared to some aspect of objective reality," the results of this project, combined with 30 years of TMT research, suggests mortality salience effects may be more consistent with those of an evolutionary-adaptive "cognitive bias." Perhaps utilizing more precise terminology such as "mortality bias," grounded in theories with greater explanatory force, would increase multi-disciplinary research regarding the effects of mortality salience, and, by extension, a better understanding of the human attentional system. Incorporating the use of the term "mortality bias" into the scientific nomenclature may also remove the stigma associated with TMT, a theory many believe to be theoretically unsound, while encouraging a wider cohort of researchers to explore this fascinating phenomenon. Regardless, the hope is the findings in this research will

constitute a small step toward a greater understanding of the human attentional system and a more efficient operation of the United States Intelligence Community.

References

Boehm, C. (1999). *Hierarchy in the forest: The evolution of egalitarian behavior*. Boston, MA: Harvard University Press.

Burke, B., Martens, A., and Faucher, E. (2010). Two decades of Terror Management Theory: A meta-analysis of mortality salience research. *Personality and Social Psychology Review*, *14*, 155-195.

Byrne, A., and Eysenck, M. W. (1995). Trait anxiety, anxious mood, and threat detection. *Cognition and Emotion*, *9*(*6*), 549 – 562. doi:10.1080/02699939508408982

Carrier, D. (2011). The Advantage of standing up to fight and the evolution of habitual bipedalism in hominines. PLoS One, *6*(5). doi:10.1371/journal.pone.0019630

Carrier D., and Morgan, M. (2014). Protective buttressing of the hominem face. *Biological Reviews*, *90*(*1*), 330-346.

Corbetta, M., and Shulman, G. L. (2002). Control of goal-directed and stimulus-driven attention in the brain. *Nature Reviews Neuroscience*, *3*(*3*), 215-229.

Costa, P. T., Jr., and McCrae, R. R. (1992). *Revised NEO personality inventory (NEO-PI-R) and NEO Five-Factor (NEO-FFI) inventory professional manual.* Odessa, FL: Psychological Assessment Resources.

Director of National Intelligence. (2012). "DNI releases FY 2012 appropriated budget for the national intelligence program." Retrieved from http://www.dni.gov/index.php/newsroom/press-releases/96-press-releases-2012/756-dni-releases-fy-2012-appropriated-budget-figure

Eysenk, M., Derakshan, N., Sanos, R., and Calvo, M. (2007). Anxiety and cognitive performance: Attentional Control Theory. *Emotion, 7*(*2*), 336 - 353.

Farber, I. E., and Spence, K. W. (1956). Effects of anxiety, stress, and task variables on reaction time. *Journal of Personality*, *25*(*1*), 1-18. doi:10.1111/j.1467-6494.1956.tb01284.x

Faneros, M. (2014). *A Comparison of contemporary executive function models*. (Doctoral dissertation). University of Oklahoma, Norman, OK.

Frewen, P., Dozois, D., Joanisse, M., and Neufeld, R. (2008). Selective attention to threat versus reward: Meta-analysis and neural-networking modeling of the dot-probe task. *Clinical Psychology Review*, *28*(*2*), 307 – 337. doi:10.1016/j.cpr.2007.05.006

Gauthier, C. (2011). Are we afraid or anxious about death? Clarifying the meaning of "terror" in Terror Management Theory. (Doctoral dissertation). New School for Social Research, New York, NY.

Goleman, D., Boyatzis, R., and McKee, A. (2002). *Primal leadership: Realizing the power of emotional intelligence:* Boston, MA: Harvard Business School Press.

Greenberg, J., Pyszczynski, T., and Solomon, S. (1986). The causes and consequences of a need for self-esteem: A Terror Management Theory. In R.F. Baumeister (Ed.), *Public and private self*, 189-212. New York, NY: Springer-Verlag. doi:10.1007/978-1-4613-9564-5_10

Greenberg, J., Pyszczynski, T., Solomon, S., Rosenblatt, A., Veeder, M., Kirkland, S., and Lyon, D. (1990). Evidence for Terror Management Theory II: The effects of mortality salience on reactions to those who threaten or bolster the cultural

worldview. *Journal of Personality and Social Psychology*, *58*(*2*), 308 – 318. doi:10.1037//0022-3514.58.2.308

Harris W., Hancock P., Harris S. and Harris, S. (2005). Information processing changes following extended stress. *Military Psychology*, *17*, 115–28. doi:10.1207/s15327876mp1702_4

Haselton, M., Nettle, D., and Murry, D. (2015). The evolution of cognitive bias. In D. M. Buss (Ed.), *The evolutionary psychology handbook* Vol. II, (pp. 986). Hoboken, NJ: John Wiley & Sons, Inc.

Haselton, M., Bryant, G., Wilke, D., Frederick, D., Galperin, A., Frankenhuis, W., and Moore, T. (2009). Adaptive rationality: An evolutionary perspective on cognitive bias. *Social Cognition*, *27*(*5*), 733-763. doi:10.1521/soco.2009.27.5.733

Judge, T. A., Ilies, R., and Colbert, A. E. (2004). Intelligence and leadership: A quantitative review and test of theoretical propositions. *Journal of Applied Psychology, 89*, 542–552

Kahneman, D. (2011). *Thinking fast and slow*. New York: Farrar, Straus and Giroux.

Kane R.., DiPino R., Kaup B., Hooper F., and Keogh J. (1996). Neuropsychological and psychiatric findings in Gulf War participants exposed to depleted uranium. *Journal of International Neuropsychology Soc*iety *2*, 68.

Kirkpatrick, L., Navarrete, C. (2006). Reports of my death anxiety have been greatly exaggerated: A critique of Terror Management Theory from an evolutionary perspective. *Psychological Inquiry*, *17*(*4*), 288 – 298. doi:10.1080/10478400701366969

Lopez, A., McDermott, R., and Petersen, M. (2011). States in mind: Evolution, coalition psychology and international politics. *International Security, 36*(*2*), 48-83. 48-83. doi:10.1162/isec_a_00056

MacLeod, C., Mathews, A., and Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology, 95*(1), 15 – 20. doi:10.1037//0021-843x.95.1.15

Navarrete, D., Kurzban, R., Fessler, D., and Kirkpatrick, L. (2004). Anxiety and intergroup bias: Terror management or coalitional psychology? *Group Processes and Intergroup Relations, 7*(*4*), 370-397. doi:10.1177/1368430204046144

Nishisato, S. (1966). Reaction time as a function of arousal and anxiety. *Psychonomic Science, 6*(4), 157-158. Doi:10.3758/bf02228005

Pagel, M. (2012). *Wired for culture: Origins of the human social mind*. New York, NY. W.W. Norton & Company Ltd.

Pyszczynski, T., Greenberg, J., and Solomon, S. (1999). A dual-process model of defense against conscious and unconscious death-related thoughts: An extension of Terror Management Theory. *Psychological Review, 106*(*4*), 835-845. doi:10.1037//0033-295x.106.4.835

Rosenblatt, A., Greenberg J., Solomon, S., Pyszczynski, T., and Lyon, D. (1989). Evidence for Terror Management Theory I: The effects of mortality salience on reactions to those who violate or uphold cultural values. *Journal of Personality and Social Psychology, 57*(*4*), 681- 690. doi:10.1037//0022-3514.57.4.681

Solomon, S., Greenberg, J., and Pyszczynski, T. (2004). The cultural animal: Twenty years of Terror Management Theory and research. In J. Greenberg, S. L. Koole, and T. Pyszczynski (Eds.), *Handbook of experimental existential psychology*. (pp. 13-34). New York: Guilford Press.

Stanovich, K., and West, R. (2000). Individual differences in reasoning: Implications for the rationality debate. *Behavioral and Brain Sciences*, *23*(*5*), 645-726. doi:10.1017/s0140525x00003435

Sylvers, P., Lilienfeld, S., LaPrairie, J. (2011). Differences between trait fear and trait anxiety: Implications for psychopathology. *Clinical Psychology Review*, *3*(*1*), 122–137. doi:10.1016/j.cpr.2010.08.004

Van Vugt, M. (2012). The nature in leadership: Evolutionary, biological, and social neuroscience perspectives. In D. Day, & J. Antonakis (Eds.), The *nature of leadership*. 141 – 175. Thousand Oaks, CA: Sage

Van Vugt, M., Ahuja, A. (2011). *Naturally selected: The evolutionary science of leadership,* New York, NY. Harper Business Publishers.

Van Vugt, M. (2006). Evolutionary origins of leadership and followership. *Personality and Social Psychology Review. 10*(*4*), 354 – 371.

Vincent, A., Roebuck-Spencer, T., Lopez, M., Twillie, D., Logan, B., Grate, S., Friedl, K., Schlegel, R., Gilliland, K. (2012). Effects of military deployment on cognitive functioning. *Military Medicine*, *177*(*3*), 248. 48-255. doi:10.7205/milmed-d-11-00156

Warden, D. L., Bleiberg J, Cameron K. L. Ecklund, J., Walter, J., Sparling, M. B., Arciero, R. (2001). Persistent prolongation of simple reaction time in sports concussion. *Neurology, 57*(*3*): 524–6. doi:10.1212/wnl.57.3.524

Wilken, J. A., Kane, R., Sullivan, C. L.,Wallin, M., Usiskin, J. B., Quig, M. E., et al. (2003). The utility of computerized neuropsychological assessment of cognitive dysfunction in patients with relapsing-remitting multiple sclerosis. *Multiple sclerosis*, *9*(*2*), 119–127. doi:10.1191/1352458503ms893oa

Appendix A: HUMINT Memory Recall Video Script

Data points 1 – 15

Neutral

- **N1**: The village you are in is called "Little Detroit" by the enemy.
- **N2**: I apologize for the rapid nature of this briefing; I haven't had time to organize my notes.
- **N3**: You have probably noticed we have had exceptionally rainy weather these last two weeks.
- **N4**: Most of the farmers are saying it's going to be an exceptionally long winter.
- **N5**: I may have to skip our next meeting as I will be traveling to New Delhi for my cousin's wedding.

Personally Threatening

- **P1:** Avoid using taxis while in country, the enemy has been using them to lure Americans to kidnap and torture.
- **P2:** When you leave, avoid the hospital road; the enemy may have placed deadly explosives there.
- **P3:** Avoid taking blankets from local villagers; the enemy has been giving blankets infected with small pox to our forces.
- **P4:** Be cautious when driving past dead animals; the enemy has been placing explosives in them.
- **P5:** Your cover may have been blown; a stranger was in the village earlier asking about the presence of Americans.

Strategic

- **P1:** There has been an increase in enemy activity around this village.
- **P2:** It was too dangerous for me to come and visit you in person.
- **P3:** The enemy uses rainy weather as cover to move explosives thru the mountains.
- **P4:** Russian President Putin may be about to introduce a peace plan between the Americans and the terrorists.
- **P5:** Long winters are good because the enemy generally stays in the mountains and decreases their attacks.

--- Script Part I ---

Hello, sorry I couldn't meet you in person today, there has been an increase in enemy activity near the village[S1], and it was too dangerous for me to travel.[S2] By the way, the village you are operating in today is called "Little Detroit" by the enemy.[N1] Speaking of Detroit, you should avoid using taxis while you are in this country, the enemy has been using them to lure Americans to kidnap and torture.[P1]

Also, when you leave the village today, avoid the hospital road; we have information the enemy may have placed deadly explosive barrels there.[P2]

I apologize for the rapid-fire nature of this briefing; I didn't have time to organize my notes before this communication.[N2]

Please, do not take any blankets from local villagers; the enemy has been distributing blankets infected with small pox to our forces.[P3]

You have probably noticed we have had exceptionally rainy weather these last two weeks.[N3] The enemy uses rainy weather as cover to move explosives through the mountains.[S3]

Be cautions when driving past dead animals in the road, there have been many incidents of the enemy placing explosives in them to attack your vehicles.**P4**

With regard to the weather, most of the farmers are saying it's going to be an exceptionally long winter.**N4**

Oh, by the way, we are hearing rumors that Russian President Putin may be about to introduce a peace plan between the Americans and the enemy.**S4**

Anyway, long winters are good for us because the enemy stays in the mountains and decreases their attacks.**S5**

Role player indicates he just received some information thru his ear piece

"I'm sorry what? OK."

I just received information that your cover may have been blown as there was a stranger in your village inquiring about the presence of Americans.**P5**

Before I forget, I may have to skip our next meeting, as I will be traveling to New Delhi for my cousin's wedding.**N5**

Data points 16 – 30

Neutral

- **N6**: Jalalabad is my ancestral home and my brother still lives there.
- **N7**: You may know I was trained on the use of explosives at a military base in Florida.
- **N8**: We have many varieties of poisonous and non-poisonous snakes in this country.
- **N9**: I only have a few more minutes; I am having lunch with my wife today.

- **N10**: I and my fighters are very tired; we haven't slept properly for weeks.

Personally Threatening

- **P6:** The temporary HQ is being used to plan an attack on your camp with the goal of killing or capturing as many Americans as possible.
- **P7:** Be cautious with captured enemy cellphones, some of them have had explosives placed inside them.
- **P8:** If you are operating in Jalalabad, avoid the apple orchards; deadly vipers live in the trees and we have no anti-venom to treat the bites.
- **P9:** The enemy has been known to use arsenic to poison the local water wells.
- **P10:** The road you will be using is watched by enemy fighters and you may be targeted.

Strategic

- **S6:** Two days ago, I was told the enemy was setting up a temporary HQ near Jalalabad.
- **S7:** My brother is working for us as an intelligence source, so please keep this information protected.
- **S8:** The enemy is becoming very expert with his use of explosives.
- **S9:** Don't be alarmed if you've noticed a large number of Chinese men in your area; they are coming here to work on a copper mining contract
- **S10**: The Chinese use arsenic in their mining operations

--- Script Part II---

Two days ago I was told the enemy was setting up a temporary HQ near Jalalabad.[S6]

Jalalabad is my ancestral home and my brother still lives there.[N6]

The temporary HQ is being established to plan an attack on your camp, with the goal to kill or capture as many Americans as possible.[P6]

My brother is working for us as an intelligence source, so please keep this information protected.[S7]

In fact, he wanted me to tell you that you should be careful with captured enemy cell phones, as some of them have had explosives placed in them.[P7]

The enemy is becoming very expert with his use of explosives.[S8]

You may know that I was trained on the use of explosives at a military base in Florida.[N7]

Incidentally, I should mention that if you are operating in Jalalabad, avoid the apple orchards; they contain very deadly vipers and we have no anti-venom to treat bites.[P8]

We have many varieties of poisonous and non-poisonous snakes in this country.[N8]

I only have a few more minutes; I am actually having lunch with my wife today.[N9]

Don't be alarmed if you've noticed a large number of Chinese men in your area; they are coming here to work on a copper mining contract.[S9]

The Chinese use arsenic in their mining operations[S10], and we've asked the company to properly secure it as the enemy has been known to use arsenic to poison the local water wells.[P9]

I and my fighters are am very tired; we haven't slept properly for weeks.[N10]

Take great care as you make your way back to camp today; the road you will be using is watched by enemy fighters and you may be targeted.[P10]

Appendix B: Screen Capture of HUMINT Video of Fictional Intelligence Source

Appendix C: Attitudes Personality Surveys of Mortality, Dental, and Automobile Salience Induction Processes

Mortality Attitudes Survey

In the space below, please spend 10 minutes writing responses to the following questions. Use the back of the sheet if you need more space. The research assistant will tell you when to stop writing.

1) What do you think will happen to you as you physically die and what will happen to your body?
2) Describe the emotions that the thought of your death arouses in you.

Dental Attitudes Personality Survey

In the space below, please spend the next 10 minutes writing responses to the following question(s). Use the back of the sheet if you need more space. The research assistant will tell you when to stop writing.

1) Describe a situation in which you recall having the worst dental pain?
2) Describe the emotions that the thought of that dental pain incident arouses in you.

Automobile Attitudes Survey

In the space below, please spend the next 10 minutes writing responses to the following question(s). Use the back of the sheet if you need more space. The research assistant will tell you when to stop writing.

1) Describe your favorite automobile including features you like the most.
2) Describe the emotions that the thought of that automobile arouses in you.

Appendix D: Word Search Distraction Exercise

When instructed to begin, please spend 5 minutes finding and circling the words listed on the below word search puzzle. If you finish before the five minutes is up, please go back over your work and make sure all the words you circled are spelled correctly.

K P F V A F W V T S T S L R T T H X S O V O L F	FLAT
O B L C W E W O I D U T S K U I L N K P C W U P	CHALET
R A A H V L L F N O H W T O H M L K C B O R B S	STUDIO
E P T T W W N T W K R R H Z V Y V F A A N Q D B	LOFT
M A L A A O K P S P B Q F D I B J T R H D X L L	CASTLE
B R M O K L B N Z A W N Z W U M J M R E O H W J	CABIN
K T T A J V M A Y F C E R M U W G J A X M L U P	RANCH
N M B L N L K D X G F S Y U D M B X B Q I Z S W	MANSION
Y E B S G S K C H V Z R N F H R R T D E N V H Q	IGLOO
B N I P I T I D I D D I K B L R A G A C I J I C	YURT
F T O V N D V O B G V I E P D D E E P I U A J J	BARRACKS
T P C M L S X R N W L B R E Y U A Q I C M R V N	BROWNSTONE
F E T O X Y W C F D X O I A N Z Y F K J A N V N	COOP
T C L M C G U W A Q W J O P N O Q V K C W B R C	BUNGALOW
E K U A X V K R M B W D M Q E C T L O M A C Y T	TENEMENT
O S J O H P R Y T H I H U V P G H S Z V B H E R	COTTAGE
H P U W J C T D D P R N O P J F A W N C S N S O	CONDOMINIUM
X Z R O X P D G K F A S B N L D B T C W E G F D	TENT
I C C I H N I X X P K N F A G E P R T M O W G U	TUDOR
A F Y X J W O L A G N U B F I B X H E O U R R T	TIPI
T F Q G X O E T G F C S N K F Q M N B J C T B C	SHACK
M E S Y C Y I R F O T H K Y F T T D C O R B L C	DUPLEX
P F N D A K W G O O O Y L U X Y H Z A M U P P A	HOUSE
O E M T M T J P S Z L T Q D R Q I I S X H L F X	APARTMENT