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Abstract

In light of the increasing use of Remotely Piloted Aircraft (RPA), commonly known as drones, and the equally increasing prevalence of post-traumatic stress disorder (PTSD) among U.S. veterans of recent wars, this study investigated the possible effects of piloting a drone aircraft and PTSD. Using a simulated drone aircraft in a computer game, the results showed that participants who simulated a drone attack and viewed the post-drone attack video reported significantly higher distress than those who viewed only the post-drone attack video. Females also showed higher distress levels than males. These results suggest the potential risks of psychological trauma even among pilots who are apparently physically far removed from the battlefield.

Keywords: psychological distress, PTSD, remotely piloted aircrafts, drone pilots

Introduction

Since the day the sun first rose over the smallest of human tribes thousands of years ago, to the vast nations of today's modern world, there has been one particular action that has fueled the evolution of society, as well as the rising and falling of many great empires: war. Though many view peaceful diplomatic channels as the best course of action to resolve disputes in our current word, there is little anyone can do to eradicate war from the dictionary. Not surprisingly, there were 17 continuous, major conflicts around the world with more than 1,000 deaths involved in each of them in 2009 (Harbom & Wallensteen, 2010). It is clear that disagreements on politics, religion, and resources will never be completely solved by bringing multiple parties together and mediating between them. As long as humanity exists, there will be conflict around the world. However, before delving further into the issues revolving around the current state the world is in, it is necessary to look back at the overall evolution of warfare from the earliest of recorded time to the present day in order to provide a historical context for the main theme of this study. After taking a brief look at war, post-traumatic stress disorder (PTSD) and its history will be introduced before attempting to link the two primary variables in the study: drone pilots and the possibility of PTSD.

Although the style of warfare has changed dramatically over the years, the brutality and overall circumstances regarding the act itself remain the same. In contrast, though, a particular problem that many military leaders over the centuries of organized warfare have encountered has been that of changing environments. Particularly in American history, one can easily move from war to war, reviewing just how much the grand strategy and tactics of warfare have changed since the country's independence from Great Britain during the Revolutionary War. From the battles of two organized armies marching toward each other in lines in the wake of massive firestorms, to the run-and-gun guerilla tactics used to effectively counter overwhelming odds, America has both employed and been on the receiving end of such tactics. And even tough international organizations and treaties have been established to regulate the brutality of war, simply killing each other is rarely considered effective. Even today, with the world becoming more globalized and possible atrocities becoming harder and harder to conceal from the public eye, war is far from fair. "Women and children are slain, male prisoners are taken only to be tortured and killed, poisoned weapons are used, treachery is general, and no quarter is given" to list a few of the tactics still present in the global society (Davie, 1929, p. 176). Never has war ever proven to be a matter of fairness or civility. Quite the contrary, the objective of war has been to destroy or incapacitate one's enemy in the quickest and most efficient manner possible while preserving oneself. Despite such changes in the overall stratagem, the psychological effects of such acts continue to adversely and negatively affect the individual soldiers that serve as pawns to the nations of the earth.

As the civilian media continues to play an ever-increasing role in reporting from combat zones across the world, the detrimental effects that the job of warrior has on service members comes to light. Aside from the typical injuries a soldier can sustain during combat, from rolled ankles to gaping chest wounds, there are nonphysical injuries with which veterans may leave the service for the rest of their lives. During a majority of American wars within the last century or so, the media has portrayed the sacrifices of those who have signed up for service and have been shipped away for war. Both a popular book and movie, Nicholas Sparks' *Dear John* has brought to light the effects of war on relationships and what veterans sometimes face when they return from the battlefront. Some return home to loving spouses and a balanced checkbook, but feel something odd within their soul. They are angered by things that normally did not anger them before deployment; find it hard to relate to those who love them the most; and wake up in the middle of the night breathing hard from flashback nightmares (Post Traumatic Stress Disorder). Taking these symptoms into consideration and reading about those veterans who return home from current combat theaters around the world, it is dismaying to think that some people consider PTSD to be a medical hoax, in an attempt to profit more from drug sales. Many claim that the diagnosis simply allows doctors and pharmacists to "open the door to making millions by billing government and private insurance companies to treat PTSD" (McFadden, 2010). In an attempt to provide counterarguments to these views, history must again be referenced for its input on the matter of combat stress in combat veterans.

The history of PTSD before the "modern war era" (which for the sake of this study is designated as the 2001-present day) is more substantial than even most experts in the psychological field might expect. Mention of symptoms similar to what soldiers experience today date as far back as the pre-Christian era, at a time when Rome and Greece were worldly powers. During the American Civil War, PTSD existed under the names of "spinal concussions" and "railway spins." "War psychoneurosis" exhibited the warning signs during World War I, and it came to be known as "battle fatigue/combat exhaustion" during World War II, on through Vietnam's "shell shock." PTSD was officially recognized around 1980 (Cantor, 2005). Though called many names, it is clear that the disorder has been prevalent both on the front and rear lines of battlefields across the world, for as long as humans have known how to carry a weapon and strike down another. It is safe to assume that the disorder does not particularly depend on technology presenting creative, and often gruesome, ways of killing another. If technology does not factor into acquiring PTSD, then it must be traced to the actual events revolving around war: killing another human, seeing comrades killed or blown up, explosions or loud noises associated with death, and even watching innocents being killed. Taking these ideas into account, it is reasonable to conclude that PTSD is at the forefront of the discussion in dealing with the wars in Afghanistan and Iraq (the latter having been recently brought to a close) because of the current environment in which the coalition troops are asked to operate on a daily basis.

The conflicts in Afghanistan and Iraq stem directly from the events of September 11, 2011 (9/11). Going on a decade of war since then, thousands of soldiers have come back injured, permanently disabled, and even killed. As of 2008, approximately 40,000 soldiers returning from the Middle East had been diagnosed with some level of PTSD (Jelinek, 2008). It is safe to estimate that the number of diagnosed cases has risen well above 50,000 in the last three years. Every job field, from the infantry grunts who take fire on a constant basis, to the gunners in the belly of an M1 Abrams tank, have taken psychological casualties from PTSD. At first glance, it seems reasonable to predict the type of people who end up with PTSD. As discussed in the preceding paragraph, these soldiers on the front lines experience everything from the bullets zooming overhead, to seeing their comrades-in-arms get shot all around them. What throws this "theory" off the mark is that PTSD is prevalent back on the home front as well. From young children to older adults, going through a particularly traumatic (hence post-traumatic) event in life leaves lasting impressions on the human psyche. So it cannot be concluded that this disorder merely comes from the jungles of Vietnam or the sands of Iraq and hills of Afghanistan. Therefore, is it safe to assume that any time period in a person's life characterized by a traumatic event, based on the proximity of a person to the said event, determines PTSD-susceptibility? Enter the drone pilot paradox. What about those military service members who are involved in the fight on a daily basis, but who never set foot in a direct combat zone?

Drone airplanes, hereafter referred to as RPAs (Remotely Piloted Aircraft), have been a developing technology since the U.S. Air Force initially flew thousands of sorties with prototype reconnaissance aircraft between 1964 and 1975. However, the Israeli Air Force drew popular attention to the wide variety of missions that RPAs could perform during the Yom Kippur of 1973, utilizing them both as decoys and flying explosives during their attacks on Egyptian radar sites (Noor & Venneri, 1997). With the U.S. attempting to bring its budget under control, shifting to RPAs as a

major source of intelligence and combat support seemed like a more-than-viable option. RPAs cost dramatically less than regular airplanes for obvious reasons, and without the risk of human life and human limitation. In other words, pilots can simply swap in and out as needed without having to land the aircraft. There are also RPAs in development by civilian U.S. corporations capable of pulling many times the G-Forces required to kill a human operator. It truly is hard to look at the U.S. military's operational structure in the Middle East now and say anything other than, "the future of weaponry is to be controlled away from the battlefield" (Groetken, 2010, p. 7). In this light, the philosophy behind RPAs sounds flawless.

However, as the drone field grows in the U.S. Air Force, so do reports of drone pilots experiencing some type of PTSD. Although the U.S. Department of Defense has not released any official figures on the matter, these claims stake the idea that drone pilots have higher-than-normal chance of developing PTSD because of the drones' ability to hover over targets to witness the aftermath of a missile strike (Chelala, 2010). When a predator drone fires a missile, the pilot and sensor operator "watch it all the way to impact …its right there and personal" ("Predator Pilots Suffer War Stress," 2008). The possibilities of these impacts on drone pilots is important and worthy of investigating based on the fact that pilot training is an expensive and long endeavor. If pilots of attack drones are indeed susceptible to PTSD effects as they carry out their daily missions, the U.S. military could suffer detrimental consequences in several respects. Pilots incapacitated by psychological illness are similar, if not identical, to the scenarios of actually losing a service member in a plane crash or to hostile action. The costs are high, even in a location where a typical person would not bet of service members becoming incapacitated to the point where they would not be able to carry out their jobs. As stated earlier, the cold reality of war again presents itself: it is as brutal as it was thousands of years ago, and no matter how far technology advances, the psychological effects could still be far-reaching.

Even though there appear to be psychological effects of participating in drone combat, not much psychological research has been devoted to identifying this process within an experimental setting. Therefore, the main aim of this study was to determine whether experimental manipulations mimicking the processes engaged in by drone combat pilots and sensor operators would yield levels of psychological distress higher than merely viewing the effects of the outcome. The idea was to design an experiment to compare the effects of computer-simulated virtual missile strikes on "military targets" and then viewing the aftermath of a drone attack, versus simply viewing a post-Predator strike video on the distress levels of the participants. We hypothesized that because of the process of actually carrying out the virtual drone strikes and watching its impact, participants carrying out the attacks would be more emotionally connected to the targets they hit and would thus score significantly higher on psychological distress than those merely watching the outcome of the strike. Additionally, even though there were few females in the experiments, considering the comparative lack of combat exposure of females, we hypothesized that females would score higher on psychological distress than males.

Method

Participants

Data were collected from 30 participants (24 males and 6 females) from the Virginia Military Institute (VMI), a predominantly white, male middle- to upper-middle class income bracket. The age range of the participants was 19-26 years of age, with the mean age of 21 years.

Materials

The experimental materials consisted of an informed consent form outlining the overall nature of the study, including the provision that they could withdraw from the study at any time without fear of any repercussions whatsoever. The Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997) was used to measure distress. IES-R is a self-report instrument that measures current subjective distress to a specific traumatic event. The scale has also been found in prior research to have strong psychometric properties. Creamer, Bell, and Failla (2003), reported internal consistency reliability of .96 for the full scale. The stimulus materials consisted of a post-Predator strike video obtained from YouTube (Brave New Films, 2009). For the experimental group we used a computer that was loaded with a Predator drone pilot scenario for the purpose of simulating combat. The drone attack simulation came from the combat flight simulator HAWX 2, and consisted of the level *Retribution* from the game.

Design and Procedure

We used a 2 (Experimental condition: simulating a drone attack and viewing the post-Drone strike video vs. Control condition: just viewing the post-Drone attack video) x 2 (Gender: Females vs. Males) factorial design. The 30 participants were randomly assigned to the experimental and control conditions. Because of the small number of females, we

randomly assigned the 6 females into the two experimental treatments. We ran the experimental group individually in 30-minute sessions. They were asked to report to the experimental room that had the computer loaded with the stimulus materials described in the materials section. The participants were briefed on the drone simulation and then given free reign of the controls. They were instructed to wear noise-cancelling headphones in order to fully take in the simulated radio chatter with background personnel. Participants were then presented with an introduction video of the missile scenario so as to get them fully focused and aware of the surroundings they were thrust into. After successfully carrying out seven different missile strikes on a variety of targets, they were immediately switched over to the post-Drone attack video. Upon completion of the video viewing, they were asked to fill out the IES-R. Once they had finished filling out the scale, they were fully debriefed. In addition, they were told to ask any questions that they might have, and given contact information so that they could bring any future questions or concerns they might have to the experimenters.

Participants in the control condition were tested in a group setting. They were asked to report to a specific classroom on Post at a certain time where there was a packet (the informed consent form and the IES-R) and were asked to read and fill the informed consent form but not continue on to the next material until they were told to do so. Upon signing the consent form, the lights were turned off and the video of a post-Predator attack (same one that was viewed by the experimental group) was played. Once it had finished playing, we turned on the light and asked them to complete the IES-R. They were instructed not to converse with their neighbors nor audibly utter any random comments. After turning in their packets, they were fully briefed, given contact information where they could send any questions or concerns and were released.

Results

The data were analyzed using the 2-way ANOVA. There was a significant main effect of experimental condition $F(1, 26) = 4.83$, $p = .037$. The experimental group – the group that simulated the missile strike and viewed the impact of the post-strike video - showed a significantly higher level of distress ($M = 11.20$, S.D. = 3.18) than the control group ($M = 8.53$, S.D. = 2.97) that simply watched the post-strike video. The effect size, computed using Cohen's *d*, was .90 which reflects a large effect. There was also a significant main effect of gender $F(1, 26) = 5.40$, $p = .028$. Females scored significantly higher on distress ($M = 12.33$, S.D. 2.33) than males ($M = 9.25$, S.D. = 3.27). The estimated effect size using Cohen's *d* was .44, suggesting a small effect. The experimental condition x gender interaction was not significant, suggesting that gender differences occurred irrespective of the treatment condition.

Discussion

We set out to examine whether simulating a Predator missile attack and observing the aftermath of the attack would be more distressing than merely viewing a video of an attack that had already been made by another person. This was to test, within an experimental set-up, the likelihood of susceptibility to PTSD-type experiences by Predator drone pilots. We hypothesized that participants who actually simulated an attack and then viewed the outcome of the attack would experience higher levels of distress compared to those that simply viewed its aftermath. This hypothesis was supported. We view this to be an important finding on a number of levels. First, there has been a tremendous increase both in the interest and prevalence of PTSD among U.S. service members and veterans over the past decade owing primarily to the wars in Iraq and Afghanistan. Even utilizing data from a few years ago, there were at least 40,000 reported cases of PTSD (Jelinek, 2008). Not much research has been conducted using the experimental approach to determining the susceptibility to PTSD.

Second, even the studies that have been conducted have been based on self-report measures of variables obtained prior to deployment and post-deployment information from clinical evaluations. These have included factors such as post-deployment readiness, combat experience, multiple deployments, and post-deployment experiences (e.g., Polusny, Erbes, Murdoch, Arbisi, Thuras, & Rath, 2011; Renshaw, 2011). More importantly, these have focused on service members who have actually been to the battlefield. Not much research interest has been paid to service members who may be exposed to essentially parallel types of psychological trauma but who are far away from the battle field, such as Air Force pilots involved with RPAs. The current study highlights the importance of including this segment of the population in studies of PTSD incidence and susceptibility. In our view, the results of this study carry some weight because even though it was just a simulation, it used a viable measure of distress – IES-R – and there has been some evidence that it can discriminate between individuals with and without PTSD (Beck, Grant, Read, Clapp, Coffey, Miller, & Palyo, 2008). Moreover, significant differences were found even when the manipulation involved only a single exposure over a relatively short period of time. This suggests that service members who

are involved in real-life (not simulations) of Predator drone attacks might be at elevated risk for PTSD.

Even though gender was not the primary focus for the study, and despite the relatively small number of females, there was still a significant gender difference in distress between males and females on distress. A possible explanation could involve the social role theory (Eagly, 1987) that explains gender differences in several domains based on historical division of labor in society on the basis of gender. Historically, females have been assigned to tasks within the home while males tend to work outside the home. Although much has changed in society, tasks involving violence, including combat, have been primarily assigned to males. There is still a lot of debate and controversy within the U.S. regarding the involvement of women in combat. Thus, the limited exposure by females to war-related themes and experiences might be the possible reason for the gender differences found in this study.

The preceding explanations notwithstanding, the fact remains that this was an experiment based on a simulation of a drone attack, and not the attack itself. Thus, external validity of these findings is rather limited. In addition, this was a single study based on a single session, so although it highlights the importance of studying this segment of the population, other studies utilizing service members themselves are needed in order to increase our confidence in the findings of this study. The first author of this article is currently part of the drone pilot community and may thus pave the way for a more realistic examination of this phenomenon on people involved in real combat. For example, we could obtain actual data on pilots involved in the drone program who are currently diagnosed or have shown signs of PTSD and compare them with those who do not seem to be affected on a number of parameters. One such comparison could be in terms of number of hours of continuous engagement. There may very well be a threshold for number of hours logged beyond which pilots become more susceptible to psychological distress. This could have implications for setting combat segments or shifts.

Another important variable may be personality. Even though drone pilots may possess the necessary skills to effectively perform the technical aspects of the task, differences in personality could account for variability in susceptibility to psychological distress. Research on stress and health has found that personality is one of the important moderators of stress. In addition to the Type A and Type B distinction, conscientiousness (one of the Big Five personality traits) has been found to moderate the impact of stress on physical and possibly mental health (e.g., Martin, Friedman, & Schwartz, 2007). People high on conscientiousness may show less reactivity to stress (Friedman, 2007), and therefore may perform in such environments and yet may be less likely to succumb to the physical and mental consequences of their stressful assignments.

A second personality-related variable that may deserve consideration is hardiness. Recent research has found hardiness to be a protective factor in determining the likelihood of experiencing PTSD in later life among females who were exposed to domestic violence during childhood (Anderson & Bang, 2012), and predictive of both performance and retention of cadets at the United States Military Academy (Maddi, Matthews, Kelly, Villarreal, & White, 2012). Future research could thus explore the role of personality in explaining the susceptibility to PTSD in this important population. In addition to pointing the way forward, one of the major contributions of this study is the attention it is poised to bring to the importance of exploring the susceptibility of service personnel who are far removed from the physical battle field to mental health problems, including PTSD.

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Table 1
Distress Levels as Function of Experimental Condition

Group	N	Mean	Std. Deviation	p
Control	15	8.53	2.97	0.037
Experimental	15	11.20	3.18	

Table 2
Distress Levels as a Function of Gender

Group	N	Mean	Std. Deviation	p
Females	6	12.33	2.33	0.028
Experimental	24	9.25	3.27	