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Expressions of Optimism Bias and "Self" Versus "Other" Perceived Controllability in the Context of Military- Related Risks

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EXPRESSIONS OF OPTIMISM BIAS AND “SELF” VERSUS “OTHER” PERCEIVED
CONTROLLABILITY IN THE CONTEXT OF MILITARY-RELATED RISKS

by

LAUREN C. LACHICA-MUSCHETT

(Under the Direction of Shauna Joye)

ABSTRACT

This study aimed to examine expressions of optimism bias and perceived controllability specifically regarding risks often associated with military service. Optimism bias refers to people’s tendency to believe they are less susceptible to experiencing negative life events compared to others. Previous studies show high levels of optimism bias are associated with strong perceptions of personal controllability. Optimism bias is a significant aspect of health promotion research particularly in the field of general occupational health and safety (OHS). However, optimism bias has never been investigated in the military OHS domain. Given the number of risks associated with military occupations, examination of optimism bias in the context of military OHS can provide useful information to enhance current military OHS risk prevention measures. We analyzed data from 145 non-military college students. They were randomly assigned to make risk judgments based on one of two deployment vignettes (first person and third person). Results of the study confirmed previous findings indicating perceived controllability was associated with optimism bias, but only for specific deployment-related events (i.e., experiencing relationship distress during deployment and alcohol use as a means to cope with combat stress post deployment). Results further revealed a main effect of point of view for two of the four studied variables in terms of optimism bias and three of four variables in terms of perceived controllability, though the direction of findings was not always as predicted. Whether participants had a caregiver in the military did not impact either optimism bias or perceived controllability, nor did point of view and having a caregiver in the military interact to affect either optimism bias or perceived controllability for any of the four variables. Implications to practice of health protective behaviors as well as directions for future research are discussed.

Index Words: Optimism Bias, Unrealistic Optimism, Perceived Controllability, Military, Occupational Health and Safety, Risk Judgment, Health Protective Behaviors

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DOCTOR OF PSYCHOLOGY

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DEDICATION

This work is dedicated to the fine men and women of the United States military, my brothers and sisters in arms. Thank you for your service and the sacrifices you make to protect our freedom and our families.

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As I sit here writing this section, I cannot help but become overwhelmed with joy, relief, and a sense of appreciation for finally reaching this point in my graduate journey. I would not have made it this far without the support and mentorship of so many amazing people who continuously provide me the motivation, strength, and guidance to keep moving forward.

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CHAPTER 1: INTRODUCTION

We have a proclivity to expect a greater likelihood of experiencing positive outcomes and lesser chances of encountering negative events compared to an average other (e.g., Perloff, 1987; Radcliff & Klein, 2002; Sharot, 2011; Weinstein, 1980). This future-oriented, self-serving tendency is known as the optimism bias. Current research describes optimism bias as a robust and multidimensional construct influenced by cognitive and motivational factors (Kunda, 1990; Shepperd, Carroll, Grace, & Terry, 2002). These factors include perceived controllability, probability, and desirability of future life events; mood; and egocentric thinking.

Biological accounts point to evolutionary origins to explain the optimism bias phenomenon (Sharot, 2011). Studies using nonhuman samples provide preliminary data supporting evolutionary bases for optimism bias. An interesting finding in examinations of optimism bias among birds (Matheson, Asher, & Bateson, 2008), pigs (Douglas, Bateson, Walsh, Bedue, & Edwards, 2012), and rats (Parker, Paul, Burman, Browne, & Mendl, 2014) shows optimism bias is most pronounced in enriched environments and appears to diminish in unenriched settings. Environmental factors relating to optimism bias are yet to be directly observed among human samples, but one might expect individuals who live in settings with more resources (e.g., urban areas) will express higher degrees of optimism bias than those who reside in areas with fewer resources (e.g., rural areas). In support of this idea, a study involving women who experience breast cancer revealed rurality was associated with lower than average quality of life and more negative emotional states (Reid-Arndt & Cox, 2010) including anxiety about negative future outcome of recovery, which is more of a pessimistic bias.

A litany of research highlights the benefits of optimism particularly as a protective factor against a host of physical and mental health issues. For example, evidence shows optimism

buffers against depression (Chang & Sanna, 2001; Hart, Vella, & Mohr, 2008) and helps to improve physical and psychological well-being and overall quality of life (Conversano et al., 2010). In contrast, considerable amount of research suggests optimism, specifically unrealistic optimism, has adverse effects. In the risk-perception literature, optimism bias is found to have a role in decreased compliance with precautionary behaviors such as safe driving methods (Dalziel & Job, 1997; White, Cunningham, & Titchener, 2011), getting vaccinations (Bond & Nolan, 2011), and safe sex practices (Gerrard, Gibbons, & Warner, 1991; Sohn, Chun, & Reid, 2012). Moreover, optimism bias is associated with increased engagement in risky behaviors such as smoking (Waltenbaugh & Zagummy, 2004) and alcohol abuse (Dillard, Midboe, & Klein, 2009). Regarding mental health, optimism bias is linked to reduced help-seeking behaviors (Spendelov & Jose, 2010) and increased depressive symptomology (O'Mara, McNully, & Karney, 2011).

Statement of the Problem

Evidence of the relationship between optimism bias and risky behaviors are well-established in the general population, but yet to be examined in the context of military-related risks. It is important to address this gap in the literature and advance the optimism bias theory in the military domain considering military service comes with greater risks of experiencing medical and behavioral health problems compared to the general population. For instance, relative to comparable civilians, service members are at higher risks for posttraumatic stress disorder (PTSD; Richardson, Frueh, & Acierno, 2010), traumatic brain injury (TBI; Hoge, Goldberg, & Castro, 2009; Tanielian & Jaycox, 2008), and interpersonal difficulties often leading to divorce (Karney & Crown, 2007) and domestic violence (Howell & Wool, 2011). In addition, despite the current drawdown of Active Duty service members and continued decrease of the veteran population, taxpayers continue to spend a disproportionate amount of money in

assisting veterans in their recovery from service-connected medical and behavioral health challenges (National Center for Veterans Analysis and Statistics, 2010). This problem signifies a need for more efficacious methods of promoting health protective behaviors within the military community. The Department of Defense (DoD) cannot fully meet this need without examining perceptions of military risks and how they impact future-oriented judgments particularly as they relate to adherence to health protective behaviors.

Purpose

The primary purpose of the study was to extend the optimism bias theory by examining expressions of optimism bias and perceived controllability regarding perceptions of common military physical and psychological risks. The current study aimed to experimentally investigate several lines of inquiry: (a) Is optimism bias related to perceived controllability across four key variables related to military OHS? (b) Are there differences in “self” versus “other” perceptions of optimism bias and controllability? and (c) Are differences in optimism bias and perceived controllability affected by having a caregiver in the military?

Significance

Examining expressions of optimism bias and perceived controllability involving military risks is important for several reasons. Preliminary data on the relationship between optimism bias and compliance with precautionary behaviors within the occupational health and safety (OHS) domain suggests understanding workers’ expectations and response to risks is crucial in maintaining occupational safety (Caponecchia, 2010). In addition, despite undeniable evidence of the benefits of optimism in promoting overall health and well-being, some findings challenge the universal application of optimistically biased expectations. Recent studies illuminate the

dangers of even small amounts of optimistically biased appraisals applied in ongoing mental health issues (O'Mara et al., 2011). Of note, the military currently employs the use of Positive Psychology principles such as optimism as stress prevention measures (Reivich, Seligman, & McBride, 2011). However, without consideration for context, these interventions may inadvertently increase optimism bias and negatively impact risk perception and behavior in service members. Given the previously mentioned risks of military service, investigation of optimism bias in the military OHS domain can lend useful information in how to tailor implementations of current health and safety protocols to include stress control measures in the military.

Definition of Terms

Comprehensive Soldier and Family Fitness (CSF2). CSF2 is the Army's current stress management program modeled after Positive Psychology principles and empirically-based practices such as Cognitive Behavioral Therapy (CBT). Its primary goal is to promote and maintain military fitness through resilience and strengths-based methodologies.

Department of Defense (DoD). The DoD is an executive branch department of the U.S. federal government responsible for management and coordination of national security affairs to include activities of all U.S. Armed Forces.

Fitness. The current study adopts the military definition of fitness which is a holistic sense of health and well-being in the physical, mental, emotional, and social domains.

Global War on Terrorism (GWOT). GWOT refers to the international military campaign against all terrorist activities that began after the coordinated attacks on the United States on September 11, 2001.

Master Resilience Training (MRT). MRT is the core component of CSF2 which trains service members on how to utilize and reinforce resilience and Positive Psychology skills in efforts to mitigate risks of military stress, particularly combat stress.

Occupational Health and Safety (OHS). OHS is a multidisciplinary field concerned with the overall health and safety of workers. OHS tends to focus primarily on health and safety protocols against work-related physical injuries and illness. In the current study, the term OHS is used with equal consideration for the psychological health and social well-being of workers.

Pre-9/11 veterans. In the current study, pre-9/11 veterans refer to the cohort of veterans who served prior to the 9/11 terrorist attacks on the United States.

Post-9/11 veterans. Post-9/11 veterans belong to the cohort of veterans who served after the 9/11 terrorist attacks against the United States. This cohort of veterans includes those who deployed in support of U.S. led multinational anti-terrorism military campaigns such as Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF).

Total Force Fitness (TFF). TFF is a holistic military fitness initiative serving as the current model for stress management programs for all U.S. military branches. CSF2 is a subcomponent of TFF. TFF is more extensive than CSF2 in terms of fitness domains and further divides fitness in the following eight areas: physical, environmental, medical, spiritual, nutritional, psychological, behavioral, and social.

CHAPTER 2: LITERATURE REVIEW

An estimated nine Americans die every day in motor vehicle accidents occurring as a result of distractions such as texting while driving. Despite this statistic, the National Highway Traffic Safety Administration reported the percentage of drivers who visibly use handheld devices while driving has steadily increased since 2009 (Pickrell & KC, 2015). A recent survey revealed 49% of adults admitted to texting while driving even though 98% of them acknowledged the act to be unsafe (Ahrens & Copeland, 2013). The result of this survey brings to light a widely recognized fact: knowing the risk of engaging in a certain behavior does not stop the behavior. Take, for instance, smoking. According to the Centers for Disease Control and Prevention (CDC), smoking is the single leading cause of preventable death and disease in the United States. The CDC also estimated cigarette smoking alone kills more than 480,000 Americans each year (U.S. Department of Health and Human Services, 2014). Regardless of public knowledge about risk for lung cancer, the prevalence of cigarette smoking among American adults remains high. Today, an estimated one in six American adults currently smoke cigarettes (CDC, 2015). This inclination to continue to engage in behaviors despite life-threatening risks is a robust and well-documented psychological phenomenon known as optimism bias.

Optimism bias is the proclivity to expect greater likelihood of positive outcomes and lesser chances of negative events happening to oneself versus peers. Other terms found in the literature describing this phenomenon include “unrealistic optimism” (Weinstein, 1980), “illusions of unique invulnerability” (Perloff, 1987), “comparative optimism” (Radcliff & Klein, 2002), and “private optimism” (Sharot, 2011). Research studies dating from the 1970s to the present time consistently show people tend to underestimate their likelihood of experiencing

negative events such as getting in a car accident (Finn & Bragg, 1986; Harré & Sibley, 2007; Robertson, 1977), being diagnosed with an illness (Fontaine & Smith, 1995; Harris & Guten, 1979; Weinstein, 1980), incurring injuries (Caponecchia & Sheils, 2011), getting divorced (Baker & Emery, 1993; Lin & Raghurir, 2005; Perloff, 1987; Weinstein, 1980), experiencing negative effects of alcohol abuse (Dillard et al., 2009; Hansen, Raynor, & Wolkenstein, 1991), and being the victim of a crime (Chapin & Pierce, 2012; Perloff & Fetzer, 1986) relative to other people's chances of encountering such life events. The term optimism bias was first coined in 1980 by Neil Weinstein, who is known for his extensive research on risk perception and prevention as well as health-protective behaviors. In his pioneer study, Weinstein (1980) illuminated the common tendency to rate oneself as above average for chances of experiencing positive life events (e.g., having a gifted child, graduating top of the class, marrying a wealthy partner) and below average for encountering unfavorable events (e.g., losing a job, developing an illness, being divorced) compared to average others. Given public knowledge about the rampancy of unemployment, crime, and divorce, it is quite astounding that the majority of individuals, about 80% according to neuroscientist Tali Sharot (2011), believe they have a better fate than everyone else. In modern times, when misfortunes are publicized instantaneously, especially since the advent of social media, optimism bias remains pervasive regardless of race, age, or gender.

Factors Influencing Optimism Bias

A number of theorists have attempted to explain how optimism bias is maintained despite harsh realities. Some studies point to monistic explanations which are either cognitive or motivational in nature to elucidate how optimism bias occurs. Other references promote integrative models (Kunda, 1990) describing optimism bias as a result of both cognitive and

motivational factors (Shepperd et al., 2002) in addition to influences of affect and egocentric biases.

Perceived controllability. Some evidence exists that optimism bias is most likely to occur if events are perceived to be controllable (Harris, Griffin, & Murray, 2008; Weinstein, 1980; Windsor, Antsey, & Walker, 2008). In his study, Weinstein (1980) found having a strong perception of controllability of an event increases optimism bias. That is, the greater the belief in influencing the outcome of an event, the greater the tendency to believe in higher chances of experiencing positive outcomes and lesser chances for negative outcomes. The logic is that it is easier to bring to mind personal abilities and intentions than to think about what others can and are willing to do to achieve desired outcomes. For instance, flying is often deemed as riskier than driving even though the National Safety Council (2013) reported more than five million driving accidents occurred in 2008 compared to 20 flying accidents in the same year. For most individuals, it is easier to achieve a sense of control when thinking about personal precautionary measures when driving than thinking about the safety protocols in which pilots engage when flying. There are debates regarding whether controllability is cognitive or motivational in nature, but most sources agree perceived controllability in relation to optimism bias is a result of egocentric thinking or the inability to take on other people's perspective simply because others' personal history, thoughts, and intentions are not as readily available as our own (Weinstein & Lachendro, 1982). Some studies found controllability is uncorrelated with optimism bias (Caponecchia, 2010; Hoorens & Smits, 2001), whereas others deemed it as adequate but not a requirement (Harris, 1996) to produce optimism bias.

Perceived probability. Perceived probability influenced by past experience is another factor influencing on optimism bias (Weinstein, 1980). Having personal past experience of a

certain event increases the tendency to perceive higher susceptibility to the event because memorability makes it easier to imagine situations in which the event could occur. Some studies conceptualize perceived probability as a subjective measure of frequency (Lichtenstein, Slovic, Fischhoff, Layman, & Combs, 1978). In studies of comparative risk assessment, optimism bias increases when events are deemed infrequent (Price, Pentecost, & Voth, 2002). Optimism bias driven by perceived probability or frequency is also attributed to egocentric biases because of the tendency to focus solely on personal susceptibility to risk when asked to make a comparative assessment (Chambers, Windschitl, & Suls, 2003).

Representativeness heuristic. Another form of cognitive bias receiving significant empirical support in relation to optimism bias is the representativeness heuristic or the tendency to estimate the likelihood of an event happening to a certain comparison target (i.e., self or other) based on the assessor's familiarity of the target and how closely the target fits the stereotype of the event (Weinstein, 1980). In the context of optimism bias, people often estimate their risks to negative events to be lower relative to the average person because they often see themselves deficient of the stereotypical features of the event. For instance, asking a parent to judge the likelihood of losing his/her child in a public setting (e.g., theme park) in comparison to the average parent's chances for the same event often leads the parent being asked to make a comparative judgment between him/her and a neglectful parent instead of the *average* parent because the representativeness heuristic prompts him/her to look for information matching the event which, in this example, is losing a child. The parent then makes a systematic miscalculation of comparing his/her attributes to stereotypical features of a neglectful parent, which is not the specified comparison target in this case.

Self-enhancement. Some experts theorize factors often linked to optimism bias are primarily motivational (McKenna, 1993; Weinstein, 1980). Current research suggests optimism occurs because of motives for self-enhancement. In their review of the foundations of optimism bias, Shepperd and colleagues (2002) explained self-enhancement creates optimism bias. Specifically, the stronger the optimism bias, the more likely a person will experience gratification because of expectations of more positive end-states and lesser anxiety about risks. In addition, self-enhancement is amplified by favorable social comparisons (Tesser, 2000, 2001). Research shows individuals tend to gauge their sense of accomplishment by comparing others' achievements to their own which leads to improved psychological well-being and adjustment (Chung, Schriber, & Robins, 2016).

Mood. Studies show mood can be a powerful correlate of optimism bias (Abele & Hermer, 1993; Harris & Hahn, 2011). Negative mood, in particular, decreases optimism bias (Harris & Hahn, 2011). When negative mood is unremitting as seen in severe depressive episodes, optimism bias disappears. Studies show people who are mildly depressed do not have an optimism bias, whereas severely depressed individuals tend to have a pessimistic bias (e.g., Korn, Sharot, Walter, Heekeren, & Dolan, 2014; Pietromonaco & Markus, 1985; Strunk, Lopez, & DeRubeis, 2006). Individuals experiencing severe major depressive episodes tend to predict higher chances for negative events than positive ones, especially in comparison to others. Similarly, some evidence exists suggesting anxiety stymies optimism bias (e.g., Dewberry & Richardson, 1990) because of sensitivity to perceived threats and the resulting tendency to focus more on the probable occurrence of negative events in order to ensure personal safety. Other sources show anxiety-based disorders such as Obsessive Compulsive Disorder (OCD) tend to diminish optimism bias (Moritz & Jelinek, 2009).

Brain-based mechanisms. Considering today's advances in technology, particularly in neuroimaging capabilities, scientists are better equipped to defend biological explanations for abstract psychological constructs. Although experts disagree about the accuracy of biological accounts of optimism bias, current research in the field of neuroscience shows groundbreaking evidence regarding the brain-based mechanisms of optimism bias. Some of the brain regions implicated in the occurrence of optimism bias include the amygdala (Sharot, Riccardi, Raio, & Phelps, 2007), caudate nucleus (Sharot, De Martino, & Dolan, 2009), and specific regions of the prefrontal cortex (Sharot, Korn, & Dolan, 2011).

Research findings indicate the brain's tendency to focus future-oriented thoughts toward positive events is a by-product of how the frontal cortex communicates with other regions of the brain. Specifically, brain imaging data revealed that when people are asked to think about desirable events, both the amygdala, shown as responsible for emotion processing, and the rostral anterior cingulate cortex (rACC), which is involved in regulating emotion and motivation, showed enhanced activity significantly stronger than when the brain receives undesirable information about the future (Sharot et al., 2007). Notably, evidence shows individuals who experience depression display abnormal activity in the amygdala (Neumeister et al., 2006) and the rACC (Eugene, Joormann, Cooney, Atlas, & Gotlib, 2011).

The caudate nucleus, which is responsible for processing and anticipating rewards, displays remarkable activity when people are asked to imagine rewarding experiences such as taking a vacation. In a study conducted by Sharot and colleagues (2007), participants were asked to pick one of two equally desirable vacation destinations such as Brazil or France. The caudate nucleus made rapid brain movements before and after decision-making. The researchers explained the caudate nucleus is responsible for signaling the brain of an incoming positive

experience as well as tracking the degree to which the experience met the anticipated desired outcome in order to enhance desirability of future outcomes.

Functional magnetic resonance imaging (fMRI) data indicate the persistence of optimism bias in the face of disconfirming evidence may be because of the brain's reduced tendency to change a positive information to a negative information when estimation errors occur (Sharot et al., 2011). For instance, in a study conducted by Sharot and colleagues (2011), specific regions of the prefrontal cortex coded for estimation errors when the errors warranted a positive update of the participants' estimation and this is true whether the participants scored high or low in trait optimism. However, for highly optimistic participants, the right inferior gyrus located in the prefrontal cortex, showed diminished tracking of estimation errors when the errors called for a negative update of the participants' estimation.

In another study, similar findings indicate the brain is inept in coding for negative information. Brain-imaging data revealed when participants were primed with positive words (e.g., clever) when they made mistakes, the anterior medial part of the prefrontal cortex, which was discovered to be responsible for self-reflection and recollection, displayed enhanced activity. However, when students were primed with negative words (e.g., stupid), this region showed significant decrease in brain activity (Bengtsson, Dolan, & Passingham, 2011). In both studies, the researchers concluded that the failure of certain regions of the brain to effectively integrate negative information may be the reason why people continue to overestimate chances for desirable events and underestimate undesirable outcomes even after they are given factual information that should alter their beliefs.

Optimism Bias and Related Concepts

With the word *optimism* serving as the umbrella term, a host of related concepts often emerge in the optimism bias literature. The most common of these concepts are the attribution bias, planning fallacy, and dispositional optimism. Although these concepts are related, it is important to distinguish how they are distinct from optimism bias.

Attribution bias. Optimism bias and attribution bias are two different constructs although they are sometimes used interchangeably. Optimism bias refers to the relative probability of an occurrence of a positive or negative event, whereas the attribution bias is concerned with ascribing the cause of a positive or negative event (Heider, 1944). In most studies, attribution bias is defined as the tendency of the self to associate negative experiences and/or failures to external factors and accredit positive experiences and/or successes to internal factors (Abramson, Seligman, & Teasdale, 1978; Kelley & Michela, 1980; Weiner, 2010). When asked to observe others' failures, the reverse is true. People tend to blame others' mistakes to internal factors and attribute accomplishments to external factors. For instance, a graduate student may attribute a late assignment to a situational cause such as a hectic schedule. An observer, perhaps another student or a professor, however, is more likely to attribute the late assignment to personal dispositions such as a lack of motivation or self-discipline. It appears both attribution bias and optimism bias are influenced by egocentricity, but this overlap does not imply sameness. A way to remember the difference between the two is to think of optimism bias as the belief that "It won't happen to me" (Caponecchia, 2010) and attribution bias as "It's not my fault" (Major, Kaiser, & McCoy, 2003).

Planning fallacy. The planning fallacy is a self-serving prediction phenomenon like optimism bias, but it is more concerned with task completion than likelihood of experiencing certain events. Specifically, the planning fallacy is the tendency to underestimate the time needed to complete “self” tasks and overestimate time needed to complete the tasks of an “average other.” (Buehler, Griffin, & Ross, 1994; Kahneman & Tversky, 1979). Taking work home on a Friday and failing to do it over the weekend is an example of the planning fallacy. Some sources describe the planning fallacy as an illustration of optimism bias, noting task completion as an easily imagined desirable outcome for the self but not necessarily for others (Shepperd et al., 2002). Empirical evidence shows the vast majority of people from politicians to economists to academics are guilty of having optimistically biased beliefs about self-specific prediction times for task completion (Buehler et al., 1994; Hall, 1980; Pychyl, Morin, & Salmon, 2000). The planning fallacy is found to be highly correlated with the optimism bias, which is not surprising considering the origins of the planning fallacy (e.g., cognitive and motivational) tend to mirror those of optimism bias (Buehler, Griffin, & Peetz, 2010).

Dispositional optimism. Dispositional optimism is the generalized belief that by and large, the future entails more favorable experiences than bad outcomes (Radcliffe & Klein, 2002; Scheier & Carver, 1985). Because of this definition, dispositional optimism is often confused with optimism bias. However, optimism bias is not merely believing in a brighter future; it pertains to the enduring belief that a person will experience more desirable events than undesirable ones *overall* and across all contexts. The specificity and social comparison components of optimism bias distinguish it from dispositional optimism (Caponecchia, 2010). In addition, research shows being generally optimistic does not necessarily make someone susceptible to optimism bias (Radcliffe & Klein, 2002).

More recent studies also make clear distinctions between optimism in the global sense (dispositional optimism) and situation-specific optimistic expectations (optimism bias) (Neff & Geers, 2013). Specifically, in the close relationships literature, research suggests individuals high in dispositional optimism or the general belief in good outcomes in the future (e.g., “Overall, I expect more good things to happen to me than bad;” Scheier, Carver, & Bridges, 1994) were more likely to engage in constructive problem-solving behaviors and experience good relationship outcomes. On the other hand, spouses who were high in relationship-specific optimistic expectations (e.g., “I expect my partner and I will always communicate well” and “I expect my partner will always be interested in how my day went;” Neff & Geers, 2013) were more likely to engage in non-constructive arguments and experience poorly adjusted marital well-being over time.

Optimism Bias Across Population Samples

Despite some arguments against the pervasiveness of optimism bias, the majority of research conveys optimism bias is a universally adopted belief. Indeed, optimism bias has been observed in various populations to include Western and non-Western cultures, children and older adults, men and women, and nonhuman samples.

Western and Eastern cultures. Evidence supports Westerners are natural self-enhancers. According to the literature, individuals from Western societies are more likely to engage in positive self-evaluations (Lee, Leung, & Kim, 2014), self-protective habits (Baumeister & Tice, 1985), and self-justification (Steele, 1988). These tendencies are often credited to the individualistic orientation of Western cultures. However, some scholars argue high self-enhancement among Westerners may be best explained by optimism bias. In fact,

some sources describe self-enhancement as another form of optimism bias (Bonanno, Field, Kovacevic, & Kaltman, 2002; Lee et al., 2014).

It is intuitive to presume Easterners do not hold an optimism bias because of their collectivistic attitudes and strong sense of interdependence. However, evidence reveals Easterners are not immune to this phenomenon, though their optimistic behavioral presentation seems to differ slightly from that of Westerners. Comparative research aimed at investigating the universality of optimism bias consistently found optimism bias was less prominent in Eastern or collectivistic cultures than what was observed in Western societies (Kim, Chiu, Peng, Cai, & Tov, 2010; Lee et al., 2014). However, low prominence was considered indicative of cultural differences, not lack of optimism bias. The most consistent findings in investigations of cultural differences of optimism bias among Western and Eastern samples are degree of expression and situational contexts (Lee et al., 2014). Research suggests Easterners are far more restrained in the way they exhibit optimism bias compared to Westerners because of the presiding norm of modesty in the Eastern world (Cai, Brown, Deng, & Oakes, 2007). Specifically, when optimism bias is evaluated in the context of self-enhancement, Easterners are more discreet and indirect in their method, and express optimism bias by denying negative traits instead of confirming positive characteristics (Kim et al., 2010). Westerners, on the other hand, are more extreme in pronouncing positive attributes and denouncing negative ones. In addition, research studies, particularly those involving East Asian participants (e.g., Chinese and Japanese participants), found specific conditions in which Easterners will more likely express optimism bias. These conditions include confirmed confidentiality of responses (Kim et al., 2010; Kobayashi & Greenwald, 2003), competitive situations (Takata, 2003), the implicit measuring of optimism bias (e.g., Implicit Association Tests; Kitayama & Uchida, 2003; Kobayashi & Greenwald,

2003), in circumstances where modesty is not the norm (Kurman & Sriram, 2002), and when optimism bias favors the group to which they belong (Endo, Heine, & Lehman, 2000).

Age differences. Optimism bias has been observed in preschool-aged children (Stipek, Roberts, & Sanborn, 1984), adolescents and emerging adults (Burger & Burns, 1988; Dillard et al., 2009; Roberts, Gibbons, Gerrard, & Alert, 2011), adults (Kuzmanovic, Jefferson, & Vogeley, 2015), and older adults (Chowdhury, Sharot, Wolfe, Duzel, & Dolan, 2014). Although optimism bias is frequently observed in adult samples, research suggests children and older adults have more pronounced levels of optimism bias than college-aged and middle-aged samples. Neuroscientists found that compared to adult participants, children and older adults are less likely to change their beliefs when informed their likelihood for certain risks are lower than the average finding (Chowdhury et al., 2014; Moutsiana et al., 2013).

Research on risk-taking behaviors (e.g., alcohol abuse; Dillard et al., 2009 and unprotected sex; Burger & Burns, 1988) conveys optimism bias is also pronounced among adolescents and emerging adults. It is important to note, however, that high optimism bias among this age group may be better explained by developmental factors such as brain maturity and sense of invulnerability (Lapsley & Hill, 2010). Invulnerability is distinct from optimism bias in that it is considered a developmental construct (Hill & Lapsley, 2009) rather than a cognitive or motivational determinant of optimism bias.

Gender differences. Consistent findings in the literature indicate men and women equally express optimism bias, with some studies noting small differences in the determinants and contexts of their optimistic beliefs (Hablemitoglu & Yildirim, 2008; Lin & Raghurir, 2005). In a 2008 study assessing gender differences in optimism bias among Turkish college students,

data revealed no statistically significant difference in overall optimism bias between male and female participants (Hablemitoglu & Yildirim, 2008). However, in this study, men were more egocentric in their bias and more likely to endorse items such as *“In the future, I will be the most popular person in the class”* (an egocentrism-based optimistic belief) and women were more focused on specific long-term positive effects and more likely to endorse items such as *“I believe going to school is important for my future”* (a focalism-based optimistic belief). The authors explained women were more realistic than men because they were able to focus on a specific outcome rather than consider all other outcomes when making expectancy judgment of future life events, a construct known as focalism (Wilson, Wheatley, Meyers, Gilbert, & Axsom, 2000).

Similar results were found in a study involving expectancy judgment and base rate comparison for divorce and favorable marriage outcomes among a sample of Taiwanese college students (Lin & Raghurir, 2005). The study revealed both men and women estimated higher chances for a happy marriage and less vulnerability to divorce compared to population base rate information (i.e., prior estimates for best friend and peers). However, when provided base rate information, only men with prior negative self-estimates changed their self-specific beliefs regarding happy marriage and divorce to be more consistent with population base rates; those who had previous positive self-estimates ignored base rate information and retained their optimistic bias. Women, on the other hand, updated their beliefs about their chances for a happy marriage and retained their optimistic bias against possibility of divorce regardless of whether their prior self-estimates were positive or negative.

Nonhuman samples. Studies using nonhuman samples suggest optimism bias may be a more primal process than previously thought. In a 2008 study, Matheson and colleagues attempted to test optimism bias in birds, specifically European starlings. During the first part of

the experiment, the birds were trained to press color-coded levers after hearing tones of specific duration. The color and the duration of the tone were associated with certain outcomes: two-second tone and red lever for an immediate reward and ten-second tone and green lever for a delayed reward. In the second part of the experiment, unreinforced probe trials were presented, and the birds were tested with tones of varying duration, but rewards continued to be dispensed only for the two-second and ten-second tones. What they found was the majority of the birds continued to press the lever associated with positive outcome (e.g., immediate reward of one pellet of food) regardless of the duration of the tone they heard. The researchers interpreted this outcome as evidence of optimism bias. Similar results occurred in previous studies of cognitive bias in rats (Harding, Paul, & Mendl, 2004; Parker et al., 2014). The ostensible expressions of optimism bias in nonhuman subjects were deemed evidence of optimism bias as a pervasive trait with strong evolutionary origins (Sharot, 2011).

Enriched versus unenriched environments. Examinations of optimism bias among nonhuman samples show cage manipulation appeared to also significantly impact expressions of optimism bias (Matheson et al., 2008; Parker et al., 2014). The studies revealed birds and rats caged in enriched environments (e.g., scheduled for routine cage cleaning; have access to water baths) were more likely to be biased toward a positive outcome than those kept in small and unenriched cages (Matheson et al., 2008; Parker et al., 2014). Moreover, samples kept in unenriched cages with fewer resources (e.g., access to water baths) exhibited a rather pessimistic bias as seen in depressed human samples (Korn et al., 2014). Similar results occurred in a study of optimism bias among pigs (Douglas et al., 2012). In this study, results show pigs raised in an enriched farm (e.g., bigger space, more straw) showed more optimistic judgment biases by being more likely to approach a hatch or quicker to approach a hatch for food when given an

unconditioned, ambiguous auditory cue compared to pigs housed in a barren farm.

Environmental factors related to optimism bias are yet to be directly observed among human samples, but in light of recent studies involving animal models, it is reasonable to expect individuals living in settings with more resources (e.g., urban areas) will express higher degrees of optimism bias than those who reside in areas with fewer resources (e.g., rural areas).

We hold the assumption that enrichment impact optimism bias given the influence of environment factors on affective or emotional states. For instance, a 2010 study revealed women who experience breast cancer and reside in rural communities were more likely to report lower than average quality of life and more negative affective states, which includes endorsement of worries about negative prognosis or future outcome following cancer treatment (Reid-Arndt & Cox, 2010). This effect is an illustration of a pessimistic bias associated with a negative affective state. This finding is notable because research supports affective states have mood-congruent effects on future-oriented cognition including likelihood estimation (judgments about what will happen in the future) and affective forecasting (judgments about how events will feel; Marroquin, Boyle, Nolen-Hoeksema, & Stantion, 2016). In addition, Reid-Arndt and Cox (2010) found rurality has an indirect effect on the participants' engagement in health protective behaviors such that they were more hesitant in seeking social support (a known health protective behavior) particularly during the early cancer recovery period.

Implications of Optimism Bias

Being optimistic about future outcomes is a well-documented protective factor against a host of physical and mental health issues. A large body of research suggests optimism buffers against depression (Chang & Sanna, 2001; Hart et al., 2008), specifically against suicidal

tendencies and loss of hope (Hirsch & Conner, 2006; Hirsch, Conner, & Duberstein, 2007). Optimism also improves coping (Nes & Segerstrom, 2006; Scheier & Carver, 1985; Strutton & Lumpkin, 1992), self-regulation (Armor & Taylor, 2003; Rasmussen, Wrosch, Scheier, & Carver, 2006), overall quality of life (Pais-Ribeiro, Da Silva, Meneses, & Falco, 2007; Schou, Ekeberg, & Ruland, 2005; Wrosch & Scheier, 2003), and physical and psychological well-being (Conversano et al., 2010; Scheier & Carver, 1992). In addition, evidence shows optimism is highly correlated with reduced sensitivity to stress (Radcliffe & Klein, 2002; Scheier & Carver, 1985), a stronger immune system (Brydon, Walker, Wawrzyniak, Chart, & Steptoe, 2009), and increased health-protective behaviors in individuals with cardiac problems (Bedi & Brown, 2005; Giltay, Kamphuis, Kalmijn, Zitman, & Kromhout, 2006).

Regarding non-health related benefits, optimism is a predictor of achievement and success in academia (Sezgin & Erdogan, 2015), economics (Crane & Crane, 2007), and sports (Vealey & Perritt, 2015). In the area of economics, optimism is linked to higher wages and tendency to work longer hours (Mohanty, 2009). Indeed, the benefits of optimism are irrefutable. However, research suggests optimism, specifically unrealistic optimism, has its own drawbacks.

In the risk perception literature, optimism bias has a role in decreased compliance to precautionary behaviors such as safe driving methods (Dalziel & Job, 1997; White et al., 2011), getting vaccinations (Bond & Nolan, 2011), and safe sex practices (Gerrard et al., 1991; Sohn et al., 2012). Moreover, optimism bias is identified as one of the underlying causes for increased engagement in risky behaviors such as smoking (Waltenbaugh & Zagummy, 2004) and alcohol abuse (Dillard et al., 2009). Furthermore, evidence suggests optimism bias leads to inattention to risk disclosures in direct-to-consumer advertising for prescription medications (Ahn, Park, &

Haley, 2014), and non-adherence to regular cancer screening in women (Ackerson & Preston, 2009).

Concerning mental health, optimism bias is linked to reduced help-seeking behaviors (Spendelov & Jose, 2010) and increased depressive symptomology (O'Mara et al., 2011). Even Positive Psychology experts warn against the dangers of optimistically biased expectations (e.g., underestimation of risks, decreased safety behaviors; Davis & Asliturk, 2011). Moreover, some findings challenge the universal application of optimistically biased expectations in severe ongoing mental health issues. For instance, in a recent study by O'Mara and colleagues (2011), optimistically biased appraisals were associated with a decline in depressive symptoms but only for individuals who were rated to have less stressful experiences. For individuals who were rated to have more stressful experiences, optimistically biased appraisals were associated with persistent depressive symptoms.

Another important consideration for application of optimistically biased expectations is within the context of uncontrollable and controllable negative experiences. Optimistic expectations were associated with long-term favorable mental health outcomes for uncontrollable negative experiences such as loss of a loved one (Bonanno et al., 2002) and being diagnosed with terminal cancer (Taylor, Lichtman, & Wood, 1984). However, longitudinal studies suggest optimistically biased expectations for controllable negative experiences such as academic pressure and difficult social interactions were correlated with poorer outcomes over time (e.g., decreased self-esteem and sense of well-being; Colvin, Block, & Funder, 1995; Robins & Beer, 2001).

Military Occupational Health and Safety (OHS)

Although research on negative effects of optimism bias is dense in the areas of social and health psychology, studies on impact of optimism bias in occupational health and safety (OHS), particularly in the military domain are sparse, if not lacking. A 2010 study conducted by Caponecchia investigated optimism bias in the OHS domain. Preliminary data from the study indicate significant levels of optimism bias regarding “self” versus “other” vulnerability to occupational risks (e.g., being injured after not wearing protective gear).

Considering the established relationship between optimism bias and risk perception, optimism bias research in the military OHS domain may have significant implications in the development and implementation of safety practices in military settings. Most notably, military service comes with a long list of physical and psychological risks, which makes it even more important to examine perceptions of vulnerability to such risks and their impact on health protective behaviors.

Physical and Psychological Risks of Military Service

Compared to the general population, service members are at a greater risk for PTSD, TBI, and interpersonal difficulties particularly in intimate relationships. The prevalence rates of these risks are higher in post-9/11 veterans than pre-9/11 veterans.

PTSD. Review of the literature indicates increased lifetime prevalence rates of PTSD in veterans from 6.2% during the Vietnam war era to 18.7% after Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) (Vinci, Mota, Berenz, & Connolly, 2016). Data released by the Department of Defense (DoD) showed significant increases in PTSD diagnoses from 0.4% (7,826 service members) in 2004 to 5.2% (123,337 service members) in 2012

(Kennell and Associates Inc., 2013). PTSD is one of the leading diagnoses (Hoge et al., 2004), and arguably the most debilitating, in both Active Duty and retired military populations. Diagnosing and treating PTSD is difficult because of heterogeneity in symptom presentation among those who experience posttraumatic stress (Galatzer-Levy & Bryant, 2013). In brief, PTSD comprises a set of clinically significant stress reactions occurring after direct or indirect exposure to a traumatic event. These stress reactions are further organized in four categories: avoidance, intrusions and re-experiencing, alterations in mood and cognitions, and hyper-arousal (American Psychiatric Association, 2013). A problem in diagnosing PTSD is some people may meet all categories, but others may not have the right combination of symptoms to meet full criteria despite obvious impairments in functioning clearly attributable to trauma exposure. Moreover, some people tend to be asymptomatic and have delayed expressions of PTSD symptoms (Bryant, O'Donnell, Creamer, McFarlane, & Silove, 2013).

Another important consideration is PTSD seldom presents as a single diagnosis in veteran samples and often co-occurs with other conditions such as depression, substance use disorder, high risk behaviors, social isolation/disconnectedness, and suicidal tendencies (Hoge et al., 2004; Vinci et al., 2016). In addition, PTSD often exacerbates existing medical conditions such as chronic pain, cardiovascular and endocrine complications, neurological disorders, and gastrointestinal problems (Institute of Medicine, 2014).

TBI. Following post-9/11 era, there were an estimated 300,000 service members who incurred a TBI during deployments (Hoge et al., 2009; Tanielian & Jaycox, 2008). TBI is one of the most prevalent diagnoses among military personnel so much so that it is considered the “signature injury” of the current conflicts in the Middle East (Hoge et al., 2009). Research indicates recovery from trauma and reintegration into non-combat settings are especially difficult

for returning combat veterans who sustained a TBI because of the brain changes impairing cognitive functioning and emotional regulation following head trauma (Meyers, Chapman, Gunthert, & Weissbrod, 2016). Brain injuries, coupled with stressors in the work place and social and family settings, present unique barriers having adverse psychological impact on service members. TBI, much like PTSD, is often associated with comorbid psychiatric conditions such as depression, changes in personality, and suicidal behaviors (Meyers et al., 2016; Simpson & Tate, 2002). Moreover, TBI is highly correlated with unemployment, interpersonal difficulties, divorce, and increased high-risk behaviors (Meyers et al., 2016; Simpson & Tate, 2002). Notably, self-identity stressors are inherent in military service, but identity strain is even more severe in TBI cases. TBI-related identity strain is greatly associated with underemployment, poor work performance, and unsuccessful reintegration into civilian communities (Meyers et al., 2016).

Interpersonal difficulties. Military stress places high demands on military families and consequently, negatively affects their health and well-being. The prevalence of divorce and domestic violence are at an alarming rate among service members. Despite the available incentives and resources for service members to preserve their marriages, research shows both men and women in the military in ages ranging from 20 to 39 have higher divorce rates than similarly aged men and women in the general population (Adler-Baeder, Pittman, & Taylor, 2008). Military demands also put service members and their spouses at risk for heightened partner relational problems, particularly domestic violence. Domestic violence within Army families alone have increased by 177% from 2003 to 2010 (Howell & Wool, 2011). Of note, reported spousal abuse cases are found to be highly associated with combat-related PTSD and TBI.

Current Stress Control Measures in the Military

Traditional military stress control directives were predominantly based on the disease model and were concentrated on *treating* uncontrolled combat stress (e.g., Field Manual 4-02.51: Combat and Operational Stress Control; Department of the Army, 2006). However, such directives are now deemed inadequate to meet the comprehensive needs of service members supporting global war on terrorism (GWOT) activities. Military leaders argue GWOT activities are unique from previous wars in that conflicts today are no longer episodic; rather, they are sustained efforts continuously impacting service members and their families (Jonas et al., 2010). The U.S. military forces attempt to address these efforts by adopting a posture of constant state of deployment readiness. For instance, U.S. Army forces in previous years were subjected to a three- to five-year deployment cycle where there is a mandatory reset period during which service members returning from combat tours were non-deployable (Army Regulation 525-29; Department of the Army, 2011). This model allowed units the ability to predict when they will be called for deployment. Today, Army units have to be ready at any given moment for any type of demand, whether it is for peacekeeping, stability, or combat operations (Jonas et al., 2010).

Total Force Fitness. In response to this new era of warfighting, Admiral Michael Mullen, former Chairman of the Joint Chiefs of Staff, congregated with over 70 scientists including medical and mental health experts, spiritual leaders, and seasoned military officials in 2009 to develop a strengths-based initiative aimed at helping service members stay resilient during periods of sustained conflict (Jonas et al., 2010). Stress control measures under this initiative were known as total force fitness (TFF). Note that fitness in non-military settings often connotes the condition of being physically fit and healthy. In the military, the term fitness has

traditionally been used in a way that encompasses health and well-being in the physical, mental, emotional, interpersonal, and spiritual domains (Mullen, 2010).

Comprehensive Soldier and Family Fitness (CSF2). TFF was officially introduced into the military community in 2009. The Army's program under this initiative became known as Comprehensive Soldier and Family Fitness (CSF2; Jonas et al., 2010). CSF2 challenges psychology's traditional response to behavioral health concerns in the military and aims to promote a proactive focus on resilience instead of a reactive approach to pathology. CSF2 is primarily modeled after the Penn Resiliency Program (PRP) developed and maintained by Positive Psychology experts, Martin Seligman and Karen Reivich. However, although CSF2 has a heavy focus on Positive Psychology, the program also incorporates modalities with well-established empirical support in the field of behavioral health such as Albert Ellis's ABC (adversity-belief-consequence) model, Aaron Beck's Cognitive Behavioral Therapy (CBT) principles (e.g., challenging negative thoughts and beliefs), John Cacioppo's social resilience, and John Gottman's *Seven Principles for a Healthy Relationship* to name a few (Reivich et al., 2011; Gottman, Gottman, & Atkins, 2011).

Master Resilience Training (MRT) is a core component of CSF2. CSF2 mandates non-commissioned officers (NCOs) in the Army to attend a 10-day MRT course to learn resilience and Positive Psychology skills, and teach these skills to their Soldiers back at their respective units (Reivich et al., 2011). The course consists of four modules focusing on resilience, mental toughness, character strengths, and strengthening relationships. The MRT course also has sustainment and enhancement components designed to help course attendees reinforce the resilience skills they learned with a specific focus on utilizing the skills during the deployment

cycle (i.e., pre-, during, and post-deployment). In addition, MRT trainees are “familiarized” with the physical and psychological expectations within each deployment phase.

Considering the serious effects of common military-related risks on the well-being of service members and their families as well as the inconsistent findings regarding advantages and disadvantages of optimistic expectations, we believe investigating expressions of optimism bias in the context of military OHS risks is relevant and necessary for the promotion and implementation of military OHS measures including current stress control interventions in the military.

Current Study

Research data on risky behaviors among service members are extensive. In addition, studies investigating predictors and correlates of risk proclivity and risky behaviors are evident in the literature. However, to our knowledge, research examining optimism bias in the context of military OHS has never been done. The aim of the current study is to evaluate expressions of optimism bias and perceived controllability in relation to military OHS risks. We chose to use a civilian sample because civilian perceptions can impact the psychological well-being of veterans, particularly those expressed during homecoming receptions of returning war veterans. For example, research shows a strong correlation between perception of lack of social support and PTSD among Vietnam veterans (Fontana & Rosenheck, 1994; Johnson et al., 1997). Notably, the civilian community spat on Vietnam veterans during their homecoming whereas currently, the general population deem OIF/OEF veterans as “noble superheroes.” (Roanova et al., 2016). This study may open pathways to better civilian understanding of military risks, which can further improve social support for military personnel from the general population.

We randomly assigned participants to either a “self” or “average other” group. Participants read a vignette about either an imagined deployment for themselves or “Sam,” a soldier of their same age and gender. Following the vignette, participants answered questions about their/Sam’s likelihood of experiencing relationship distress, disconnection from family and friends, combat-related injuries, and use of alcohol for coping while deployed. Participants also completed a questionnaire about their/Sam’s ability to control outcomes in the four aforementioned areas. In addition to the “self” versus “other” groups, participants were separated by those with and without caregivers in the military, with the expectation that those who had caregivers in the military would be more familiar with problems faced by service members and therefore show a different pattern of optimism bias and perceived controllability than those who did not have caregivers in the military. In addition, we controlled for gender and rurality (proxy variable for enrichment) based on previous research suggesting both gender (e.g., Hablemitoglu & Yildirim, 2008; Lin & Raghubir, 2005) and enrichment (e.g., Douglas et al., 2012; Matheson et al., 2008; Parker et al., 2014) impact optimism bias. To assess for rurality, we asked the participants to indicate the rurality of both their current residence (current rurality) and where they grew up (childhood rurality). Please note that for the current study, we only controlled for childhood rurality.

Based on the existing literature, we made the following hypotheses about participants’ optimism bias and perceived controllability regarding susceptibility to military OHS risks:

1. Across groups, optimism bias and perceived controllability would be related for all four key variables (i.e., experiencing relationship distress with a significant other while deployed, feeling disconnected from friends and family members while

deployed, incurring combat-related injuries while deployed, and using alcohol as a way to cope with combat stress after deployment).

2. There would be a main effect of point of view such that those who read the first person vignette (“self”) would report higher levels of optimism bias and perceived controllability than those who read the third-person vignette (“average other”).
3. There would be a main effect of military exposure (i.e., having a caretaker who was/is in the military) such that those who had a caretaker who was/is in the military would report higher levels of optimism bias and perceived controllability than those who did not have a caretaker who was/is in the military.
4. There would be an interaction between point of view and military exposure such that the highest scores for optimism bias and perceived controllability would be seen in participants who read the first person vignette (“self”) and indicated having a caregiver who was in the military, and the lowest scores would be seen in participants who read the third-person vignette (“average other”) and indicated not having a caretaker who was in the military. We expected moderate and similar scores for the other two groups (first person, no military exposure and third person, military exposure).

CHAPTER 3: METHODOLOGY

Participants

We recruited 155 participants through an undergraduate psychology participant pool. Because we wanted a civilian sample, we excluded 1 student enrolled in ROTC, 7 students who were veterans of the U.S. Armed Forces, and 2 students currently serving in the U.S. military. Our final sample included 145 participants (44 men and 101 women). Ages ranged from 18 to 34 years old, with a mean age of 19.73 ($SD = 2.09$). Most participants were never married ($n = 136$) and 7 participants indicated being married. Most participants had no children ($n = 141$). Most were either first-year ($n = 57$) or sophomore ($n = 51$) students. Participant ethnicities included 81 Caucasian, 40 African American, 7 Native American, and 2 Asian American students. Fifteen participants identified as multiracial. Regarding military exposure, most participants had no caregiver who was/is in the military ($n = 101$) and 42 participants indicated having a caregiver who was/is in the military. For childhood rurality, the mean was 3.71 ($SD = 1.56$). Participants were given 1 research credit for their participation that was applied to psychology course requirements.

Materials and Measures

Deployment vignette (Appendix A). Participants were randomly assigned to read one of two versions of the fictional deployment vignette: one written in “self” point of view and the other from a perspective of an “average other.” The deployment vignette included information such as length of deployment, command expectations, threat level, living conditions, and availability of resources to communicate with family members and friends at home. At the end of the vignette, participants answered 3 questions as manipulation checks ensuring they understood

the deployment orders. We included a participant's response in our data if he or she obtained at least 2 correct answers out of the 3 manipulation check items.

Optimism Bias Questionnaire (Appendix B). To measure optimism bias, participants completed a 4-item Optimism Bias Questionnaire created for the current study. Participants completed the version of this questionnaire that matched the group to which they were randomly assigned (first or third person point of view). Participants rated, using a slider, the likely occurrence of deployment-related events on a 7-point Likert scale ranging from 1 (*extremely unlikely to happen*) to 7 (*extremely likely to happen*) as has been used in previous optimism bias research (e.g., Caponecchia, 2010; Job, Hamer, & Walker; 1995). For the current study, higher ratings on this scale indicated lower optimism bias.

Controllability Questionnaire (Appendix C). Participants rated, using a slider, the same events as in the Optimism Bias questionnaire for the Controllability Questionnaire on a 7-point Likert scale ranging from 1 (*I can't do anything that affects the chances of this happening*) to 7 (*My actions completely control the chances of this happening*). Similar to the Optimism Bias Questionnaire, participants completed the version of this questionnaire that matched the group to which they were randomly assigned (first or third person point of view). For the current study, higher ratings on this scale indicated higher perceived controllability.

Demographics survey (Appendix D). Participants provided demographic information including age, gender, marital status, number of children (if any), education level, maternal education, current employment status, total household income, ethnicity, race, and religious preference. The demographic survey also included military-related questions such as branch of service, prior military experience, prior deployments, length of deployment if applicable, and if

they had a caregiver who was/is in the military (military exposure). To assess for rurality, participants indicated the rurality of both their current residence (current rurality) and where they grew up (childhood rurality).

Procedure

Participants were recruited through an undergraduate psychology participant pool for this online study. Participants who agreed to participate, completed a consent form and were randomly assigned to either a first person or third person point of view group. They then read a deployment vignette, answered validity questions, and completed the Optimism Bias Questionnaire, the Controllability Questionnaire, and a brief demographics survey. After completion of the survey, participants were debriefed and provided contact information of the researchers should they have any questions or concerns about the study (see Appendix E).

CHAPTER 4: RESULTS

To review briefly, the current study used a 2 (first person, third person) x 2 (military exposure, no military exposure) between-groups design. Point of view (first person, third person) and military exposure served as the independent variables (IVs), optimism bias and perceived controllability as the dependent variables (DVs), and gender and childhood rurality as covariates. Point of view served as a true IV because we randomly assigned participants to this group. Military exposure, on the other hand, was a quasi-IV as it is a pre-existing variable. We had a total of 8 DVs: 4 optimism bias questions and 4 perceived controllability questions.

To determine the relationship between optimism bias and perceived controllability, we calculated bivariate correlations between optimism bias and perceived controllability for each of the four deployment-related events included in both the optimism bias and controllability questionnaires. Please note we did not separate the sample by first and third person for this analysis. For experiencing relationship distress, the results of the analysis revealed a moderate negative relationship, $r(138) = -.25, p = .003, r^2 = .06$, between optimism bias ($M = 3.62, SD = 1.99$) and perceived controllability ($M = 4.15, SD = 1.70$). For coping through alcohol use, the results also revealed a moderate negative relationship, $r(124) = -.26, p = .003, r^2 = .07$, between optimism bias ($M = 4.39, SD = 1.91$) and perceived controllability ($M = 4.25, SD = 2.43$). For feeling disconnected from family, the results revealed a non-significant correlation, $r(135) = .05, p = .558$, between optimism bias ($M = 5.57, SD = 1.43$) and perceived controllability ($M = 3.45, SD = 1.62$). Similarly, for incurring injury, the relationship between optimism bias ($M = 5.64, SD = 1.25$) and perceived controllability ($M = 3.25, SD = 1.59$) was also non-significant, $r(131) = .01, p = .902$. For a full correlation matrix of all the 8 DVs, please see Table 1.

To determine whether point of view or military exposure affected optimism bias and perceived controllability, we analyzed the data using a 2 x 2 (point of view by military exposure) MANCOVA, with participant gender and childhood rurality input as covariates as previously discussed. Because of missing data for 32 participants, the sample size for this analysis was 113. For the main effect of point of view, optimism bias for experiencing relationship distress (higher for first person) and coping through alcohol use (higher for third person) were significant as well as perceived controllability for experiencing relationship distress (higher for third person) and coping through alcohol use (higher for first person). For descriptive and *F*-statistics, please see Table 2).

For the main effect of military exposure, none of the 8 DVs were significant (see Table 3). Additionally, there were no interactions between point of view and military exposure for any of the 8 DVs: optimism bias for experiencing relationship distress, $F(1, 107) = .45, p = .503$; optimism bias for feeling disconnected from family, $F(1, 107) = .02, p = .888$; optimism bias for incurring injury, $F(1, 107) = 2.17, p = .143$; optimism bias for coping through alcohol use, $F(1, 107) = .03, p = .865$; perceived controllability for experiencing relationship distress, $F(1, 107) = .07, p = .797$; perceived controllability for feeling disconnected from family, $F(1, 107) = 1.10, p = .297$; perceived controllability for incurring injury, $F(1, 107) = 1.85, p = .177$; and perceived controllability for coping through alcohol use, $F(1, 107) = .24, p = .627$.

CHAPTER 5: DISCUSSION

The purpose of this study was to attempt to extend optimism bias theory by applying it to military occupational health and safety (OHS). Specifically, we aimed to experimentally investigate the effects of “self” versus “other” point of view on expressions of optimism bias and perceived controllability in the context of common military-related OHS risks. To meet this goal, we examined the following questions: (a) Is optimism bias related to perceived controllability across four key variables related to military OHS? (b) Are there differences in “self” versus “other” perceptions of optimism bias and controllability? and (c) Are differences in optimism bias and perceived controllability affected by having a caregiver in the military?

Relationship Between Optimism Bias and Perceived Controllability

Consistent with previous findings (e.g., Harris et al., 2008; Weinstein, 1980; Windsor et al., 2008), we found optimism bias correlated with perceived controllability but only for certain deployment-related events. Specifically, we found support for this correlation for coping with alcohol and relationship distress, but not for feeling disconnected from friends and family members or sustaining a combat-related injury.

Given the unpredictable nature of physical injuries from combat and the limited resources and time to communicate with friends and family members while in a war zone, participants may have viewed these events as less controllable (or uncontrollable), which in turn may have lowered the correlation between controllability and optimism bias for these events. As previously noted, evidence shows optimism bias is most likely to occur if events are perceived to be controllable (Harris et al., 2008; Weinstein, 1980; Windsor et al., 2008). The deployment vignette did emphasize the combat zone to which they would deploy is a high-threat environment

which receives weekly indirect bombing and is prone to suicide bombers. The vignette also warned participants of the inconsistent and limited usage of communication resources during the deployment (see Appendix A). It is possible these specified deployment conditions may have influenced the participants' perceptions of control.

It is likely participants deemed alcohol use and relationship distress as more controllable than other domains because they are internally and psychologically driven (emotional aspects of military OHS) versus physical injuries and feeling disconnected from loved ones due to limited communication as being largely controlled by the wartime environment (physical aspects of military OHS). Perhaps there is something inherently different about the physical aspect of military OHS compared to the emotional/psychological domain of military OHS in terms of impact on perceptions of control. This may be an important consideration for future research in this area.

“Self” versus “Other” Perceptions of Optimism Bias and Controllability

As predicted, we found significant differences between “self” versus “other” perceptions of optimism bias and controllability for use of alcohol as a coping mechanism as well as a difference in controllability for feeling disconnected from family. We asked participants to imagine themselves or another person (Sam) in a combat situation. Our findings indicated participants believe they were less likely to use alcohol and had more control over feeling disconnected from family and using alcohol to cope than Sam. We anticipated these results given what we know about optimism bias theory and its association with perceptions of control: people are inclined to estimate less susceptibility to risks pertaining to self versus peers (e.g., Perloff, 1987; Radcliff & Klein, 2002; Sharot, 2011; Weinstein, 1980). Additionally, the more people

perceive control over certain risks, the more likely they are to be optimistically biased against such risks (e.g., Harris et al., 2008; Weinstein, 1980; Windsor et al., 2008). Granted, we found limited support and only for two variables, but we are encouraged nonetheless.

Interestingly, although we also found a significant difference between “self” versus “other” perceptions of optimism bias and controllability for relationship distress, it was in the opposite direction than we predicted. Our participants believed Sam was less likely to experience relationship distress and had more control over this aspect of his/her life when deployed than they (the participants) would in the same situation. It is possible the demographic makeup of the sample impacted our results. Only 7 participants indicated being married, and the majority were first-year and sophomore students. Recall that familiarity with certain risks increases optimism bias (Weinstein, 1980). It is plausible that because the participants were relatively unfamiliar and inexperienced in managing intimate relationships in the context of military deployment, they might have felt inclined to estimate their vulnerability to relationship discord higher than Sam’s, therefore decreasing their optimism bias and perceived controllability.

Optimism Bias and Controllability Among Those with and without Military Exposure

In the current study, having a caregiver in the military did not impact either optimism bias or perceived controllability, nor did point of view and having a caregiver in the military interact to affect either optimism bias or perceived controllability for any of the four deployment events. Again, we know familiarity increases optimism bias (Weinstein, 1980) as well as perceived controllability (e.g., Weinstein & Lachendro, 1982). However, it could be that having a caregiver in the military does not necessarily make someone familiar with military risks to the degree needed to affect perceptions of control or optimism biases against such risks.

The lack of findings with regard to military exposure could also be due to our small sample size. We needed a sample size of 128 for full power. Our original sample size was 145; however, due to missing participant data, we narrowed it down to 113, which, statistically, did not give us enough power to detect significant results assuming a moderate effect size.

Possible Clinical Application of the Current Study

In recent years, the field of psychology gradually shifted its focus from the disease model to a movement toward a strengths-based approach to pathology. In line with this movement, the U.S. military has fully embraced a strengths-based approach in the implementation of combat and operational stress prevention measures. For instance, the U.S. Army's CSF2 program currently uses Positive Psychology principles to promote resilience and optimism. However, as previously discussed, even Positive Psychology experts warn against the dangers of optimistically biased expectations (e.g., Davis & Asliturk, 2011). We also discussed the limited versus universal application of optimistically biased expectations in certain mental health domains (e.g., relationship outcomes; Neff & Geers, 2013; ongoing depressive symptomology; O'Mara et al., 2011). O'Mara and colleagues (2011) found optimistically biased appraisals were associated with decreases in depressive symptoms, but only for individuals who endorsed having less stressful experiences; for individuals with more severe stressful experiences (e.g., traumatic experiences), optimistically biased appraisals were correlated with persistent depressive symptomology. Certainly, service members – and in particular those who were in combat – are likely to experience significant stressful situations (e.g., Hoge, 2010). In support of this claim, recall the staggering rates of alcohol abuse comorbid with PTSD, depression, and suicidal gestures (Hoge et al., 2004; Vinci et al., 2016), and relationship difficulties, particularly domestic violence (Adler-Baeder et al., 2008; Howell & Wool, 2011), within the military community.

We found significant results, in the direction we predicted, for alcohol use as a means to cope with combat stress in terms of optimism bias being positively associated with perceived controllability and optimism bias higher for first person than third-person. Now that we know optimism bias exists at least for some military risks, it may be worth pursuing whether military personnel's expectations and perceptions of military-related risks impact ongoing mental health concerns and engagement with health protective behaviors. Although a direct investigation into the role optimism bias plays in clinical application is outside the scope of this study, we hope providing preliminary evidence for optimism bias in the context of military-related risks will inform future research in this domain.

Limitations

One of the limitations of the current study is poor external validity. We used a civilian sample comprised primarily of Caucasian young adults to investigate expectancy judgment and perceptions of control involving military risks. As previously discussed, having a caretaker who was/is in the military may not be enough "exposure" to military culture as the participants had no firsthand experience of risks involving military service; they may only have surface knowledge of military risks. To gain useful information in how to implement current OHS protocols in the military, it is paramount to examine expressions of optimism bias in the military OHS domain according to how *actual* military personnel (i.e., Active Duty, Veterans, ROTC) perceive relative risks and how their perceptions impact their compliance with health protective behaviors promoted through military OHS measures. Future research should re-examine this study with a more diverse military sample to improve generalizability. Nevertheless, this study provided data on civilian perceptions of military risks, which, as noted previously, may lead to better understanding and improved social support from the general population.

Additional limitations involve methodology. Particularly, this study was based on reading a deployment vignette. As a next step, we might try a more in vivo approach, such as having participants watch a deployment video rather than just read a vignette, write a reflection on their imagined experience, or engage in a virtual reality experience, all of which may promote deeper processing of the hypothetical deployment. Finally, as noted above, for full power we needed a sample size of at least 128, and we had 113 in our final sample. Future studies should use a larger sample size to find significant relationships from the data and ensure a representative distribution of the population.

Conclusion

This study was the first to experimentally investigate expressions of optimism bias and perceived controllability in the military OHS domain. By doing so, we extended the optimism bias paradigm by providing preliminary data on the relationship between optimism bias and “self” versus “other” perceived controllability regarding common military OHS risks. Now that we know optimism bias exists, at least in some domains, we can work to address it. Given the sheer number of problems faced by service members and their families and the conflicting findings in the literature about the pros and cons of optimistic appraisals, we believe more research is needed to inform whether current OHS measures and/or clinical interventions for service members should promote or work to attenuate optimism bias. We hope collecting data on these trends will guide future research, particularly clinical application research, in this area.

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APPENDIX A

Deployment Vignette (“Self” Point of View)

Imagine you are an Active Duty Soldier. You are being deployed to Camp Erbil in Iraq. Your deployment orders indicate that you will be serving in Iraq for a period of 9 months, but your deployment is now extended to a 12-month rotation due to needs of the mission.

During this deployment, your Company will be split into two groups and will serve under two different commands. You will not be completing this deployment with all your fellow unit members in the same location. Some of you will be sent to different regions in Iraq, and you will be working with multinational forces and local authorities. You will also be assigned additional duties that are different from your primary tasks and responsibilities.

Camp Erbil is located in a high-threat environment. The base typically receives indirect mortar fires 2 to 3 times per week, sometimes more. You are required to wear your protective equipment on and off duty, even if you are only going to use the bathroom. You will receive cultural awareness training to learn the values and norms of the local populace. Be on high alert and aware of your surroundings. The villages surrounding the base are known to use women and children as suicide bombers. In addition, some of the routes you will be taking when you travel outside the wire are known for improvised explosive device (IED) attacks.

In terms of living conditions, you will be assigned to tents that sleep 8 to 10 people, and you will be sleeping on cots. There will be no hot water. There will be hot chow but expect to eat MREs or pre-packaged meals on days that you go outside the camp ground.

You have a few communication resources to connect with your family. You have access to call centers at the Morale, Welfare, and Recreation (MWR) facility, and phones and internet services at the United Service Organizations (USO) center. There are private local internet and cellphone providers in the area, but you will have to pay for these services on your own. You may receive letters and care packages, but there is no consistent schedule for mail pick-up and delivery. If you do decide to purchase your own cell phone, you may carry it with you at all times, but you are not allowed to use it during guard duty and any missions outside the camp ground.

To make sure that you understand the deployment orders, please answer the following questions:

1. *How long is the duration of your deployment according to your orders?*
 - a. *6 months*
 - b. *9 months*
 - c. *12 months*

2. *What is the threat level in the area to which you are being deployed?*
 - a. *Low*
 - b. *Moderate*
 - c. *High*

3. *What will you need to have with you at all times?*
 - a. *Cell phone*
 - b. *Protective equipment*
 - c. *Deployment orders*

Deployment Vignette (“Average Other” Point of View)

Imagine that Sam, who is your same age and gender, is an Active Duty Soldier. Sam is being deployed to Camp Erbil in Iraq. Sam’s deployment orders indicate that Sam will be serving in Iraq for a period of 9 months, but Sam’s deployment is now extended to a 12-month rotation due to needs of the mission.

During this deployment, Sam’s Company will be split into two groups and will serve under two different commands. Sam will not be completing this deployment with all of Sam’s fellow unit members in the same location. Some of them will be sent to different regions in Iraq, and Sam and Sam’s unit members will be working with multinational forces and local authorities. Sam will also be assigned additional duties that are different from Sam’s primary tasks and responsibilities.

Camp Erbil is located in a high-threat environment. The base typically receives indirect mortar fires 2 to 3 times per week, sometimes more. Sam is required to wear protective equipment on and off duty, even if Sam is only going to use the bathroom. Sam will receive cultural awareness training to learn the values and norms of the local populace. Sam is expected to be on high alert and aware of the surroundings. The villages surrounding the base are known to use women and children as suicide bombers. In addition, some of the routes Sam and Sam’s unit members will be taking when traveling outside the wire are known for improvised explosive device (IED) attacks.

In terms of living conditions, Sam and Sam’s unit members will be assigned to tents that sleep 8 to 10 people, and they will be sleeping on cots. There will be no hot water. There will be hot chow but Sam and Sam’s unit members are expected to eat MREs or pre-packaged meals on days that they go outside the camp ground.

During this deployment, Sam has a few communication resources to connect with Sam’s family. Sam has access to call centers at the Morale, Welfare, and Recreation (MWR) facility, and phones and internet services at the United Service Organizations (USO) center. There are private local internet and cellphone providers in the area, but Sam will have to pay for these services out of pocket. Sam may receive letters and care packages, but there is no consistent schedule for mail pick-up and delivery. If Sam decides to purchase a personal cell phone, Sam may carry it at all times, but Sam is not allowed to use it during guard duty and any missions outside the camp ground.

To make sure that you understand Sam’s deployment orders, please answer the following questions:

- 1. How long is the duration of Sam’s deployment according to Sam’s orders?
 - a. 6 months*
 - b. 9 months*
 - c. 12 months**

2. *What is the threat level in the area to which Sam is being deployed?*
 - a. *Low*
 - b. *Moderate*
 - c. *High*

3. *What will Sam need to have at all times?*
 - a. *Cell phone*
 - b. *Protective equipment*
 - c. *Deployment orders*

APPENDIX B

Optimism Bias Questionnaire (“Self” Point of View)

Please rate the likelihood of you experiencing the following events:

- 1. How likely are you to experience relationship distress with a significant other while deployed?

1-----7

Extremely unlikely

Extremely likely

- 2. How likely are you to feel disconnected from friends and family members while deployed?

1-----7

Extremely unlikely

Extremely likely

- 3. How likely are you to have combat-related injuries while deployed?

1-----7

Extremely unlikely

Extremely likely

- 4. How likely are you to use alcohol as a way to cope with combat stress after deployment?

1-----7

Extremely unlikely

Extremely likely

Optimism Bias Questionnaire (“Average Other” Point of View)

Please rate the likelihood of Sam experiencing the following events:

- 1. What is the likelihood of Sam experiencing relationship distress with a significant other while deployed?

1-----7

Extremely unlikely

Extremely likely

- 2. What is the likelihood of Sam feeling disconnected from friends and family members while deployed?

1-----7

Extremely unlikely

Extremely likely

- 3. What is the likelihood of Sam incurring combat-related injuries while deployed?

1-----7

Extremely unlikely

Extremely likely

- 4. What is the likelihood of Sam using alcohol as a way to cope with combat stress after deployment?

1-----7

Extremely unlikely

Extremely likely

APPENDIX C

Controllability Questionnaire (“Self” Point of View)

Please rate the degree of controllability you have in the likelihood of you experiencing the following events:

1. I have control whether I experience relationship distress with a significant other while deployed.

1-----7

*I can't do anything that affects
the chances of this happening*

*My actions completely control
the chances of this happening*

2. I have control whether I feel disconnected from friends and family members while deployed.

1-----7

*I can't do anything that affects
the chances of this happening*

*My actions completely control
the chances of this happening*

3. I have control whether I incur combat-related injuries while deployed.

1-----7

*I can't do anything that affects
the chances of this happening*

*My actions completely control
the chances of this happening*

4. I have control whether I use alcohol as a way to cope with combat stress after deployment.

1-----7

*I can't do anything that affects
the chances of this happening*

*My actions completely control
the chances of this happening*

Controllability Questionnaire (“Average Other” Point of View)

Please rate Sam’s degree of controllability in Sam’s likelihood of experiencing the following events:

1. Sam has control whether Sam experiences relationship distress with a significant other while deployed.

1-----7

*Sam can’t do anything that affects
the chances of this happening*

*Sam’s actions completely control
the chances of this happening*

2. Sam has control whether Sam feels disconnected from friends and family members while deployed.

1-----7

*Sam can’t do anything that affects
the chances of this happening*

*Sam’s actions completely control
the chances of this happening*

3. Sam has control whether Sam incurs combat-related injuries while deployed.

1-----7

*Sam can’t do anything that affects
the chances of this happening*

*Sam’s actions completely control
the chances of this happening*

4. Sam has control whether Sam uses alcohol as a way to cope with combat stress after deployment.

1-----7

*Sam can’t do anything that affects
the chances of this happening*

*Sam’s actions completely control
the chances of this happening*

APPENDIX D**Demographics survey****1. What is your gender?**

- Male
 Female
 Other: _____

2. What is your age?**3. What is your marital Status**

- Now married
 Widowed
 Divorced
 Separated
 Never married

4. Do you have children? If so, how many?**5. What is your current year in school**

- First year
 Sophomore
 Junior
 Senior

6. What is the highest degree or level of school your mother has completed? If currently enrolled, mark the previous grade or highest degree received.

- No schooling completed
 Nursery school to 8th grade
 Some high school
 High school graduate - high school diploma or the equivalent (for example: GED)
 Some college credit
 Associate degree
 Bachelor's degree
 Master's degree
 Doctoral degree

7. How many credit hours are you taking this semester?

8. What is your current employment status?

- Employed for wages
- Self-employed
- Out of work and looking for work
- Out of work but not currently looking for work
- A homemaker
- Retired
- Unable to work

9. What is your total household income? Please include only yourself and a spouse if you have one.

- Less than \$10,000
- \$10,000 to \$19,999
- \$20,000 to \$29,999
- \$30,000 to \$39,999
- \$40,000 to \$49,999
- \$50,000 to \$59,999
- \$60,000 to \$69,999
- \$70,000 to \$79,999
- \$80,000 to \$89,999
- \$90,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more

10. Please specify your ethnicity:

- Hispanic or Latino
- Not Hispanic or Latino

11. Please specify your race. You can choose more than 1:

- American Indian or Alaska Native
- Asian
- African American
- European American
- Native Hawaiian or Other Pacific Islander
- Other

12. Are you currently serving in the military? If so, what branch?**13. Are you currently enrolled in ROTC?**

APPENDIX E

Debriefing and How to Obtain Research Credit

Thank you for your participation in this survey. If an adverse event occurs as a result of this study, or if you have any questions at all about the study, please contact Shauna Joye, Ph.D., via e-mail at sjoye@georgiasouthern.edu or Lauren Lachica-Muschett, M.S., via email at ll02151@georgiasouthern.edu.

If you are taking this survey for class credit, you **must** e-mail the primary researcher at this address:

militarystudy2016@gmail.com

In your email, you are to note your name, course section number, instructor of record, and the time and date in which you completed the survey. The primary researcher will respond back to each participant indicating that she has received notification that you have completed this survey. If you do not receive a response back within a few days, please e-mail her again or contact Dr. Joye's office at 912-478-0748.

To contact the Office of Research Compliance for answers to questions about the rights of research participants or for privacy concerns, please call the Georgia Southern University Office of Research Services and Sponsored Programs at [\(912\) 478-5465](tel:9124785465). This project has been reviewed and approved by the GSU Institutional Review Board under tracking number [H17047](#).

Table 1

Zero-Order Correlations between Optimism Bias and Perceived Controllability Variables

Measure	Measure						
	1	2	3	4	5	6	7
1. OB Relationship Distress	--						
2. OB Feeling Disconnected	.38*	--					
3. OB Incurring Injuries	-.08	.19*	--				
4. OB Alcohol Use	-.36*	.03	.39*	--			
5. PC Relationship Distress	-.25*	.21*	.26*	.35*	--		
6. PC Feeling Disconnected	.09	.05	-.005	.02	.24*	--	
7. PC Incurring Injuries	-.13	-.06	.01	.02	.10	.42*	--
8. PC Alcohol Use	.64*	.24*	-.09	-.26*	-.01	.20*	.04

Note. $N = 145$. OB = *Optimism Bias*, PC = *Perceived Controllability*.

* $p \leq .05$

Table 2

MANCOVA Statistics for Main Effect of Point of View with Gender and Childhood Rurality as Covariates

Variable	Point of View				<i>F</i> -statistic
	First Person (<i>n</i> = 54)		Third Person (<i>n</i> = 59)		
	EMM	SEM	EMM	SEM	
Optimism Bias					
Relationship	5.39	.15	2.00	.14	$F(1, 107) = 262.93, p < .001, \text{partial } \eta^2 = .71$
Family	5.68	.20	5.27	.20	$F(1, 107) = 1.99, p = .162$
Injury	5.28	.19	5.67	.18	$F(1, 107) = 2.14, p = .147$
Alcohol	3.22	.24	5.30	.23	$F(1, 107) = 38.49, p < .001, \text{partial } \eta^2 = .27$
Controllability					
Relationship	3.75	.23	4.63	.22	$F(1, 107) = 7.28, p = .008, \text{partial } \eta^2 = .06$
Family	3.80	.23	3.12	.22	$F(1, 107) = 4.44, p = .037, \text{partial } \eta^2 = .04$
Injury	2.89	.24	3.24	.28	$F(1, 107) = 1.07, p = .304$
Alcohol	5.75	.27	2.52	.27	$F(1, 107) = 70.69, p < .001, \text{partial } \eta^2 = .40$

Note. EMM = estimated marginal mean; SEM = standard error of the mean.

Table 3

MANCOVA Statistics for Main Effect of Military Exposure with Gender and Childhood Rurality as Covariates

Variable	Military Exposure				<i>F</i> -statistic
	Military Exposure		No Military Exposure		
	EMM	SEM	EMM	SEM	
	<i>(n = 34)</i>		<i>(n = 79)</i>		
Optimism Bias					
Relationship	3.76	.17	3.63	.11	$F(1, 107) = .41, p = .523$
Family	5.40	.24	5.56	.15	$F(1, 107) = .34, p = .562$
Injury	5.23	.21	5.71	.14	$F(1, 107) = 3.51, p = .064$
Alcohol	4.10	.27	4.43	.18	$F(1, 107) = 1.02, p = .314$
Controllability					
Relationship	4.26	.26	4.12	.17	$F(1, 107) = .20, p = .656$
Family	3.53	.26	3.39	.17	$F(1, 107) = .21, p = .649$
Injury	2.75	.27	3.37	.18	$F(1, 107) = 3.58, p = .061$
Alcohol	4.26	.31	4.02	.21	$F(1, 107) = .41, p = .523$

Note. EMM = estimated marginal mean; SEM = standard error of the mean.