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Posttraumatic Cognitions as a Pathway from Resilience to Sleep in First Responders

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Posttraumatic Cognitions as a Pathway from Resilience to Sleep in First Responders

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A dissertation submitted in partial fulfillment

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Abstract

First responders experience repeated trauma exposure within a unique environment that subjects them to multiple personal and professional stressors, discourages vulnerability, and disrupts sleep (Chamberlin & Green, 2010; Vargas de Barros et al., 2013). First responders have been shown to have higher rates of posttraumatic stress disorder, as well as more frequent negative effects of their symptoms including adverse effects on their personal and professional functioning (Cheng et al., 2018; Gayton & Lovell, 2012). While first responders face significant risks to their mental health in the line of duty, there is insufficient population-specific research focused on these unique risks, the associated sleep disturbance, and any constructs that may be protective (Jones, 2017; Jones et al., 2018). Trait psychological resilience, defined as personal characteristics that facilitates adaptation to stress, has been shown to predict lower levels of mental and physical health outcomes (Burns & Anstey, 2010; Roden-Foreman et al., 2017; Straud et al., 2018). Trait resilience may combat the increased vulnerability to mental health outcomes and disturbed sleep in this population (Straud et al., 2018). In a sample of 127 first responders (14 females, 113 males) from the Pacific Northwest, two mediation models were tested. The first analysis evaluated a simple mediation model predicting sleep disturbance from trait resilience mediated by total posttraumatic cognitions. Second, a parallel moderated mediation model predicted sleep disturbance from trait resilience mediated by each the subcategories of posttraumatic cognitions (self, world, self-blame) with duty related stress as a moderator. Results from the simple mediation showed that posttraumatic cognitions mediated the relationship between resilience and sleep disturbance in first responders. In the second moderated mediation model, resilience negatively predicted all three posttraumatic cognitions

subscales, and duty related stress amplified (moderated) the effect of resilience on cognitions about self-blame. Only posttraumatic cognitions about the self predicted higher sleep disturbance, and none of the posttraumatic cognitions subscales mediated effects on sleep, suggesting that general shared variance rather than specific types of posttraumatic cognitions was important for linking resilience and sleep. Interventions targeting resilience are discussed in the context of first responders.

Keywords: trait psychological resilience, fire fighter, self-blame, posttraumatic stress

Chapter 1: Introduction and Literature Review

The term *first responder* encompasses several divisions of emergency services to include law enforcement, rescue agencies, healthcare, firefighters, and paramedics (Jones, 2017). First responders as a population share unique characteristics that present increased risks for mental health concerns. The day-to-day responsibilities of a first responder are highly demanding, extremely stressful, and potentially hazardous to their mental and physical health (Vargas de Barros et al., 2013). Further, the culture of first responders may discourage disclosure of the need for and use of mental health treatment (Chamberlin & Green, 2010). Work as a first responder may also involve repeated trauma exposure and this population has been shown to have an increased rate of posttraumatic stress symptoms (Vargas de Barros et al., 2013). In addition to posttraumatic stress symptoms, first responders have multiple risk factors for disturbed sleep including a variable shift schedule, high levels of stress, and repeated trauma exposure (Ramey et al., 2012; Rajaratnam et al., 2011). Cognitive processes have been shown to play a central role in both posttraumatic stress symptoms and sleep disturbance. Posttraumatic stress symptoms and sleep disturbance have been shown to be related in the general population and have both been associated with negative posttraumatic cognitions, trait resilience, and stress; however, few studies have investigated the relationships between these variables in first responder populations (Sexton et al., 2018; Wild et al., 2016). Trait psychological resilience or the ability to overcome adversity has been shown to be protective against high levels of stress and may be of interest in first responder populations; resilience might counteract the increased vulnerability to posttraumatic stress symptoms and sleep disturbance in this population (Straud et al., 2018). However, research examining predictors, mediators, and moderators of sleep disturbance in first responders is scant (Meyer et al., 2012). The present study examines whether, in first responders,

resilience predicts sleep outcomes directly and indirectly via posttraumatic cognitions, and whether these relationships change based on first responders' levels of job stressors. First, I provide a literature review to provide background and rationale.

First Responders

The title, *first responder*, describes individuals working in various divisions of law enforcement, rescue, healthcare, firefighters, emergency medical technicians (EMTs) and paramedics (Jones, 2017). First responders play an important role delivering essential emergency services in order to provide safety, protection, and emergency medical services within their communities. For the purpose of this study, I will focus on fire fighters, EMTs, and paramedics when referring to first responders. These first responders are the first on the scene at similar emergencies, and experience similar risks, services, and training processes (Jones, 2017). First responders are the primary group addressing natural disasters and man-made emergencies, including fires, vehicle accidents, critical incidents, and medical emergencies (Henderson et al., 2016; "Psychological First Aid", 2018). First responders are exposed to highly dangerous and intensely stressful situations in the line of duty (Straud et al., 2018).

First Responders and Stress

The work of a first responder is fraught with many professional stressors including high physical, psychological, and psychosocial demands in multiple contexts. According to Lazarus and Folkman's transactional model, coping with stress is conceptualized as a dynamic, interactive process between the person and the environment (1984). According to this theory, the individual has agency to influence the outcome of the stressor through their thoughts, emotions, and behaviors. In the context of this theory, individuals experience stress when they believe that

an event is a threat, as well as when they perceive that they are unable to cope with the event or do not have the resources to cope with the demands of a stressor (Lazarus & Folkman, 1984).

First responders experience high levels of stress from both on-duty and off-duty experiences. Personal stressors include pressure to maintain a work-life balance, variable sleep schedules, and marital strain, among others. Sleep disturbance may result from both professional and personal stressors, but itself can also be considered to be an impactful occupational stressor associated with multiple negative outcomes (Meyer et al., 2012).

Duty Related Stressors

Serving as a first responder means working in a stressful environment. First responders operate in challenging, hazardous, and unpredictable work environments where they have low levels of control and therefore face uncommon risks to both their mental and physical health. Professional stressors can include mental and physical work demands, such as personal knowledge/connections to community members impacted by events; witnessing a duty related injury or death of a co-worker; rendering aid to children or adolescents; lack of emotional, psychological, material, or other resources, organizational issues, managerial conflicts; having to convey tragic news; rendering aid while loved ones are present; rendering aid to sexual assault victims; the death of a patient; being first on the scene of a suicide; treating patients that resemble a loved one; staying vigilant for ever-present risks; emotional strain, pressure to appear competent and confident, and increased professional commitments (Folwell & Kauer, 2018). Physical hazards that first responders experience include intense demands on their musculoskeletal systems leading to injury, extreme temperatures, exposure to hazardous materials, infectious materials, long and unpredictable shift schedules, and high stress (Reichard

& Jackson, 2010). It is common for this population to respond to critical incidents where they directly witness violence, human suffering, pain, and the struggle for survival (Onyedire et al., 2017). Because of the life-and-death nature of these intense professional stressors, many first responders may perceive that they do not have the resources to effectively cope and subsequently experience high levels of stress. Additionally, the high stress level inherent to the work of a first responder has also been shown to predict insomnia and sleep debt (Kivistö et al., 2008; Vargas de Barros et al., 2013). Furthermore, the culture of first responders is also unique and may intensify the risks for mental health problems.

Cultural Risks

In addition to these duty related risks, the culture of first responders may inherently carry additional dangers that can negatively impact their mental health. The first responder culture stresses close social bonds, acceptance from peers, mutual respect, psychological toughness, strength, resiliency, and independence (Fay et al., 2006). The culture of first responders highly values peer acceptance and strength. These pressures to conform to peer expectations may dissuade first responders from seeking mental health treatment and participating in research, as well as overt displays of adaptive characteristics such as warmth, compassion, and sensitivity. Due to these values and pressure, the culture of first responders can explicitly discourage or stigmatize both the need for help and seeking help via mental health (Cheng et al., 2018; Fay et al., 2006). Within the culture of first responders, mental health disorders and their treatment tend to be associated with detrimental stigma (e.g., perceived weakness or lack of resilience) and may lead to negative career related consequences. In response to these cultural pressures and barriers in pursuing mental health care, first responders may utilize less productive coping mechanisms

including substance abuse, avoidance coping, and social isolation; further, these coping mechanisms have been associated with increased psychological distress (Brown et al., 2002; Cheng et al., 2018). If first responders are willing to defy cultural expectations in order to seek mental health treatment, there can sometimes be further organizational barriers such as variable shift scheduling and availability of services (Cheng et al., 2018).

First Responder Mental Health

While there are several mental health risk factors inherent to the duties of a first responder, there is also little research on mental health within this population. Experiencing repeated occupational stressors as a first responder in particular has been associated with posttraumatic stress syndrome (PTSS), compassion fatigue, burnout, depression, and higher rates substance use disorders (Meyer et al., 2012; Pietrantonio & Prati, 2008). Because of the high levels of stress and associated negative psychological symptoms, the ability to withstand and even grow from adversity could be a valued areas of interest with first responders in order to help to rebound from their high occupational demands (Smith et al., 2019; Straud et al., 2018). However, much of the previous research focused on this population has centered on the response to and effects of natural disasters or critical incidence such as Hurricane Katrina or 9/11. There is a significant gap in the research related to prevalence of mental health issues and unique day-to-day risks in this population (Jones, 2017; Jones et al., 2018). Due to these intense demands of the job, first responders may be subjected to repeated trauma exposure. This pattern of exposure may lead to an elevated risk of posttraumatic stress symptoms (PTSS) and other mental health issues (Chamberlin & Green, 2010; Cheng et al., 2018), as well as high rates of sleep disturbance (Jones et al., 2018).

First Responders and PTSS

First responders, due to their duty obligations, have an increased risk of developing posttraumatic stress symptoms (PTSS) or posttraumatic stress disorder (PTSD). PTSD is a commonly used diagnosis in clinical psychology; however, the symptoms of PTSD are often dimensional in nature and may best represent a continuum of individual adaptation to trauma exposure (Forbes et al., 2005; Kliem et al., 2016). The symptoms of PTSD after trauma exposure are divided into four categories: intrusion symptoms (reexperiencing), avoidance (of thoughts, feelings, or cues), negative cognitions and mood, and hyperarousal (American Psychiatric Association, 2013). All individuals that have been exposed to traumatic events have some risk of developing post PTSS or PTSD. PTSS is commonly found in individuals (such as first responders) that experience repeated exposure to trauma like and experience associated distressing symptoms without meeting the full criteria for PTSD. For the purpose of this study, we will focus on PTSS. First responders are subject to repeated trauma exposure (while having limited control, as noted above) and have an increased risk of developing PTSS (Skogstad et al., 2015). In the general population, 3.5% to 5.6% of individuals develop PTSD symptoms; in contrast, the rate of PTSD in firefighters has been estimated (due to lack of available data) to be as high as 37% (Ben et al., 2006; Cheng et al., 2018). Repeated trauma exposure, increased stress, sleep disorders, and pre-existing mental health concerns have been associated with an elevated risk of developing PTSS in this population (Henderson et al., 2016). Additionally, longer trauma exposure, lack of control, close contact with victims, lack of resources, and lack of social support have all been shown to predict PTSS in first responders (Skogstad et al., 2011).

In addition to higher rates of PTSS, first responders may be uniquely subject to increased negative effects of PTSS including relationship impairment, decreased wellbeing, negative effects on social and family life, missed work, increased risk for comorbid diagnoses, increased distress, and increased risk of suicide (Cheng et al., 2018; Gayton & Lovell, 2012). However, there exists limited research focused on the *negative posttraumatic cognitions* that first responders hold about themselves and the world, in the wake of traumas, as well as how they impact mental health variables and relevant outcomes such as sleep (Smith et al., 2019). Both risk *and* protective factors for the development of PTSS symptoms are poorly understood for first responders (Chamberlin & Green, 2010). In the small amount of research available, years of service, thoughts of self-blame, lower levels of social support, and self-esteem have all been linked with increased levels of traumatic stress symptoms, as well as depression, in first responder populations (Carey et al., 2011; Chamberlin & Green, 2010). In this population, rumination (i.e., chronic negative cognitions) and sleep disturbance have been shown to be the most often reported symptoms (Haslam & Mallon, 2003). Given that sleep disturbance is a common complaint in first responders with PTSS, the relationship between negative cognitions and sleep merits further exploration.

Sleep Disturbance

Sleep disturbance is a general term used to describe issues with falling and staying asleep. It has also been used to describe having fewer than six hours of continuous sleep each night (Grandner & Pack, 2011). In addition to general sleep disturbance, there exist multiple dimensions that speak to the nature of one's sleep, including sleep quality, sleep latency, sleep duration, and sleep efficiency (Miller et al., 2019). Additionally, use of sleep medications and

daytime dysfunction (difficulty focusing, difficulty with memory, difficulty making decisions) are also important constructs relevant to sleep (Buysse et al., 1989). *Sleep quality* remains difficult to define and is usually derived from a subjective report that includes several characteristics of sleep (depth or restfulness; Buysse et al., 1989). *Sleep latency* is defined as the time between turning the lights off and falling asleep (Shrivastava et al., 2014), with lower latency assumed to indicate better sleep. *Sleep duration* is the amount of time spent sleeping and seven or more hours per night is recommended for good health (Watson et al., 2015). Lastly, *sleep efficiency* can be thought of as the percentage of total time in bed while the individual is asleep (Shrivastava et al., 2014), with higher efficiency indicating healthier sleep. When factor analyzed, these sleep dimensions may be best represented by a three-factor structure; sleep efficiency (sleep duration, sleep efficiency); sleep quality (sleep quality, sleep latency, and sleep medications); and daytime disturbance (sleep disturbance, daytime dysfunction; Cole et al., 2006). Sleep disorders are characterized by difficulty with quality, timing, and quantity of sleep, as well as daytime impairment and distress. There are a variety of sleep disorders; however, insomnia is most common (American Psychiatric Association, 2013).

Sleep disturbance is of particular importance given research linking it to increased risks of both medical and mental health disorders, as well as decreased mental and physical performance (Carey et al., 2011). Unfortunately, trauma exposure and PTSS may have a bidirectional relationship with sleep disturbance (Cox et al., 2017; Miller et al., 2019; Zhen et al., 2018). Sleep disorders (i.e., insomnia, nightmares, sleep apnea, and other sleep related concerns) have also been shown to demonstrate high prevalence rates in PTSD and are sometimes a residual complaint even after the treatment of PTSD (Spoormaker & Montgomery, 2008).

Previous literature has shown that disturbed sleep may be associated with depression, suicidal ideation, and suicide attempts (Cox et al., 2017; Spoormaker & Montgomery, 2008).

Sleep and First Responders

The obligations of a first responder subjects them to several risk factors for disturbed sleep. As noted above, the work of a first responder involves the variable schedule of shift work, high stress work environments, and trauma exposure. For first responders, variable shift schedules, extended workdays, increased stress, and exposure to trauma have all been linked to sleep disturbance (Ramey et al., 2012; Rajaratnam et al., 2011). The high levels of stress that first responders experience have been associated with increased risks for sleep disturbance and PTSS symptoms (Meyer et al., 2012; Vargas de Barros et al., 2013). Recent research suggests that first responders experience sleep disturbances at a significantly elevated rate in comparison to the general population (51-59%; Carey et al. 2011; Vargas de Barros et al. 2013).

Sleep and Shift Work

Shift work can adversely affect sleep. In addition to the hazards of the job of a first responder, their variable shift schedule also presents challenges. First responders are required to work long hours with unpredictable shift schedules and have little control over their schedule, which may contribute to sleep disturbance (Jones et al., 2018; “Psychological First Aid,” 2018). Shift work has been shown to compound sleep issues and is believed to impact sleep negatively. Shift work necessitates a sleep schedule that can conflict with natural circadian rhythms, thus creating impairments in both sleep and work performance (Wickwire et al., 2017). Among shift workers, in general, sleep disturbance and fatigue are common and can contribute to further negative outcomes such as on-the-job accidents, mental health concerns, and physical health

concerns (Patterson et al., 2012). For first responders in particular, irregular and unpredictable shifts that are common in this line of work first responders experience can be even more detrimental. While the length and frequency of first responders' shift schedules vary from department to department, first responders are commonly expected to respond to emergencies at all hours of the night, leading to high levels of sleep disturbance (Carey et al., 2011; Smith et al., 2019).

Sleep and Trauma

In addition to shift work as a risk factor for sleep, the multiple stressors and repeated exposure to trauma that first responders experience as a normative part of their professional roles may negatively influence sleep (Vargas de Barro et al., 2013). It has been well established that individuals with PTSS or trauma exposure are prone to associated sleep problems. As noted, previous research has shown that the relationship between PTSS and sleep disturbance may be bidirectional (Cox et al., 2017; Miller et al., 2019). Kliewer and Lepore (2015) found that exposure to trauma may be associated with sleep problems due to a lack of social support or cultural pressure to restrain oneself when attempting to discuss the traumatic experience. Poor sleep quality specifically, has been shown to have significant negative effects in those diagnosed with PTSS including increased symptom severity (Babson et al., 2011; Babson et al., 2012). First responders operate in an environment characterized by numerous risk factors for sleep disturbance including variable shift schedules, high stress, and exposure to trauma. However, the *mechanisms* or factors contributing to these sleep disturbances are not well understood (Zhen et al., 2018); in particular, the role of cognitive processes in sleep disturbance warrants

investigation (Vargas de Barros et al., 2013). I will model sleep as an outcome, examining cognitive explanations for sleep disturbance.

Cognitive Processes

Cognitive Processes and PTSS

Cognitive symptoms and processes are theorized to be central to the development and maintenance of PTSS (Ehlers & Clark, 2000; van Heemstra et al., 2020). Several cognitive risk factors such as attributional style, avoidance coping, perceptions of low social support, and negative posttraumatic cognitions have been associated with vulnerability to PTSS (Wild et al., 2016). For instance, rumination is a repetitive cognitive process associated with multiple mental health disorders, in which individuals repeatedly and passively fixate on their symptoms, causes, consequences, and features of distress in the absence of active problem solving (Nolen-Hoeksema et al., 2008). Rumination specifically has been shown to be a key predictor and an effective target for cognitive intervention in PTSS (Birrner & Michael, 2011; Wild et al., 2016). In the first responder population in particular, rumination has been shown to be one of the most common posttraumatic processes (Haslam & Mallon, 2003). Negative posttraumatic cognitions are of particular importance for understanding posttraumatic stress. Posttraumatic cognitions include negative appraisals of oneself, the world, and others (Ehlers & Clark, 2000; Foa et al., 1999). They have been shown to predict the development of PTSD, whereas reductions in them have been linked to PTSD symptom reduction (Ehlers & Clark, 2000; Wild et al., 2016). More specifically, negative cognitions about the self and self-blame have been shown to have the strongest association to PTSS symptoms (Lancaster et al., 2011). Overall, previous research has supported a relationship between negative posttraumatic cognitions and the maintenance and

severity of PTSS symptoms in the general population; however, the role of posttraumatic cognitions in first responders and the link of these cognitions to sleep in this population, remains unexplored (Sexton et al., 2018; Wild et al., 2016).

Cognitive Processes and Sleep

Cognitive processes have been theorized to play a central role in shaping sleep. Negative cognitive processes before sleep have been shown to have an adverse impact on sleep in the general population (Guastella & Moulds, 2007). In the general population, repetitive cognitive processes, cognitive arousal, and negative trauma related cognitions before sleeping have been linked to with difficulty sleeping (Harvey et al., 2002; Kalmbach et al., 2020). For instance, rumination during the afternoon and evening has correlated with sleep disturbance (Birrer & Michael, 2011; Pillai & Drake, 2015). Individuals prone to trait rumination, after experiencing a stressful event, experienced lower sleep quality (Guastella & Moulds, 2007). Similarly, worry, another type of repetitive thought, is associated with repeated or intrusive thoughts around potentially adverse outcomes due to a perceived threat (Pillai & Drake, 2015). Thus, rumination and worry serve as examples of how negative cognitive processes may play an important role in the development and maintenance of sleep disturbance (Pillai & Drake, 2015).

Trauma-Related Cognitions and Sleep

More precisely among individuals that have been exposed to trauma, negative cognitions have been shown to negatively impact sleep. Kliewer and Lepore (2015) found that exposure to trauma may be associated with sleep problems due to persistent trauma-related cognitions, in addition to lack of social support or cultural pressure to restrain oneself when attempting to discuss the traumatic experience. Intrusive thoughts after trauma exposure have also been shown

to be related to sleep disturbance in adolescents and combat veterans (Kliewer & Lepore, 2015; Miller et al., 2019). Previous studies have shown that traumatic exposure was associated with sleep disturbance in a multipath model through negative cognitions (measured by the Posttraumatic Cognitions Inventory; Zhen et al., 2018). A cognitive theory of insomnia has suggested that those with sleep disturbance attempt to use avoidance strategies for negative emotions and negative cognitive beliefs activated by the trauma in an attempt to control them. However, these strategies are counterproductive and may instead increase sleep disturbance by increasing cognitive arousal (Babson et al., 2011). Some research has hypothesized that first responders who experience negative cognitions would be more likely to experience depressive symptoms and then develop sleep disturbances (Beck, 2004; Zhen et al., 2018). An alternate theory suggests that trauma exposure activates fear and fear related cognitions, increasing the incidence of fear reactions to trauma related cues which then increases physiological arousal and disrupts sleep (Zhen et al., 2018). Further avoidant coping strategies may increase the likelihood of disturbing dreams; these also disrupt sleep (Zhen et al., 2018). Nonetheless, despite theories positing that negative cognitions impact sleep disturbance, very limited research has examined negative cognitions (and posttraumatic cognitions in particular) as vulnerabilities predicting sleep disturbance in first responders. Moreover, limited research has investigated strengths or traits that might protect first responders against such cognitive processes and downstream effects on sleep. Resilience is one potential protective factor.

Resilience

Psychological resilience is a difficult construct to define. Resilience is not merely recovery from stress nor the absence of psychopathology (Bonanno, 2008). Resilience is a

multidimensional construct that has been defined in multiple ways and may vary due to culture and context. According to Bonanno (2008), resilience is the ability of individuals to maintain healthy and steady functioning when experiencing an adverse event. Other definitions stress that resilience is a protective factor that can buffer the individual's response to environmental risks for adversity (Rutter, 1987). Resilience has also been conceptualized as an individual's ability to cope with adversity (Lee & Cranford, 2008). According to Luthar et al. (2000), resilience can be a dynamic process of successful adaptation while experiencing adversity. While there are numerous definitions of resilience, when used in the context of human psychology, trait resilience is defined as individual proneness to flourishing despite stress or adversity; and in that sense, exposure to stressful events is necessary for resilience to occur (Connor & Davidson, 2003). While resilience has been thought of as coping, a process, or a trait, for the purpose of this research we will focus on self-reported psychological trait resilience.

Trait resilience is believed to represent a group of personal characteristics that allows adaptation to stress (Connor & Davidson, 2003). Core to most definitions of psychological trait resilience are two concepts: adversity and positive adaptation (Fletcher & Sarkar, 2013). Adversity can also be thought of as risk or challenging life circumstances (Luthar & Cicchetti, 2000). Positive adaptation can be thought of as one's ability to overcome or bounce back (Luthar & Cicchetti, 2000; Windle, 2011). While stress is a universal part of the human experience, an individual's ability to effectively overcome can be highly protective (Connor & Davidson, 2003).

Trait resilience has been associated with several positive outcomes. Individuals that display high levels of trait resilience recover more quickly after stressful events, experience more positive emotions, have positive health outcome, have increased optimism, have an internal locus

of control, experience increased positive self-image, and respond to stress with positive coping that leads to growth and further development (Burns & Anstey, 2010; Hu et al., 2015).

Resilience, Trauma, and Stress

Multiple studies have suggested the possibility of resilience playing a role in prevention, given findings of trait resilience predicting lower symptoms of physical illness and mental health disorders (Burns & Anstey, 2010; Roden-Foreman et al., 2017; Straud et al., 2018). Resilience has also been studied in the context of trauma exposure. Research on resilience in the general population has shown that individuals demonstrating adaptive coping capacities may have improved outcomes after trauma exposure (Tsai et al., 2012). Trait resilience has also been shown to buffer the effects of workplace stress for critical care nurses and doctors, as well as, predicted lower burnout (Arrogante & Aparicio-Zaldivar, 2017). In a study of military service members with combat exposure, trait resilience was found to be ameliorative against negative mental health outcomes (Russell et al., 2019). Trait resilience has also predicted positive coping and outcomes after stressful experiences such as trauma exposure (Lee, 2019).

Additionally, resilience has been shown to be related to PTSS symptoms and sleep disturbance in first responders (Carey et al., 2011; Straud et al., 2018). Resilience is believed to be protective when first responders face high levels of stress due to organizational pressures, dangerous situations, and trauma exposure (Straud et al., 2018). The concept of resilience is especially important in first responder populations because exposure to high stress events is an integral duty, and first responders are vulnerable to the development of physical and mental health symptoms. In trauma-exposed first responders, resilience may be one of multiple individual characteristics that likely act together to provide protection against the development of

PTSS symptoms (Lee, 2019; Marmar et al., 2006). Resilience may be helpful to maximize recovery after stressful events and minimize the physical and psychological risks of duty related trauma exposure in first responders (Pietrantonio & Prati, 2008). Therefore, it follows that trait resilience may be both protective and ameliorative for first responders (Russell et al., 2019). However, there is little research exploring relationships between resilience and sleep in this population.

Trait Resilience and Sleep

A relationship between trait resilience and lower sleep disturbance has been well documented in the general population. For instance, in the general population a positive correlation has been found between trait resilience and sleep quality (McCleustion, 2016). Rapid eye movement sleep or REM sleep has also been shown to be related to resilience (Kobayashi et al., 2016). REM sleep has been shown to be more prominent (i.e., higher REM theta power) in those that are resilient to trauma and is associated with the processing of emotional stimuli and the consolidation of negative affective memories (Cowdin et al., 2014; Kobayashi et al., 2016). In human studies, research has found that individuals that do not develop PTSS after trauma exposure have more adaptive memory processing marked by increased theta power (theta power is associated with learning and memory) during REM sleep which may be a marker of resilience (Cowdin et al., 2014). In contrast, REM sleep disruption is commonly found in those diagnosed with PTSS (Cowdin et al., 2014). Additionally, sleep and resilience processes may share neuronal networks in the prefrontal cortex (Parrino & Vaudano, 2018). In animal studies, higher resilience measured with brain-derived neurotrophic factor has been associated with improved REM sleep after stressful events (Sweeten et al., 2020). However, despite links of resilience to

sleep in animal and general populations, studies have neglected to investigate resilience as a predictor of sleep dysfunction in first responders (Parrino & Vaudano, 2018).

Resilience and Posttraumatic Cognitions

While trait resilience has been associated with improved sleep quality, the mechanisms of this relationship are not well understood. This relationship is also not well understood in the context of trauma exposure and PTSS. Previous research has shown that higher trait resilience has been negatively associated with PTSD and those having high trait resilience have a lower risk of developing PTSD (Connor & Davidson, 2003). One potential construct that may mediate the relationship between resilience and sleep disturbance is posttraumatic cognitions. Resilience operationalized as the process of recovery has been linked to lower engagement in negative cognitive processes (Bonanno, 2004; Zang et al., 2017). Previous studies have also shown that posttraumatic cognitions mediated the relationship between trait resilience (framed as a personal resource alongside social support and unit cohesion) and PTSD symptom severity in a sample of active-duty military personnel returning from deployment. It remains plausible that individuals who are highly resilient may experience less negative posttraumatic cognitions about self and the world, particularly in the context of duty-related stress, and this may have downstream effects on sleep quality. However, trait resilience has not been studied in relation to posttraumatic cognitions and sleep disturbance. Furthermore, given the idea that resilience is most important in the context of stress, understanding effects of resilience on sleep in first responders requires consideration of the duty related stress.

Stress as a Moderator

Duty related stress may moderate the relationship between resilience and posttraumatic cognitions in first responders. A meta-analysis on resilience showed that adversity significantly moderated the relationship between trait resilience and mental health outcomes; the resilience-health relationship was stronger for individuals with increased adversity (Hu et al., 2015). These findings are in line with the concept that trait resilience most fully manifests when individuals face adverse situations (Connor & Davison, 2003; Fletcher & Sarkar, 2013). In the context of first responders, as duty related stressors increase, trait resilience may more strongly and negatively predict posttraumatic cognitions and subsequently less disturbed sleep. There is scant research on the relationship between trait resilience and mental health outcomes in first responders moderated by duty related stressors.

Present Study and Hypotheses

The relationship between resilience, stress, posttraumatic cognitions, and sleep among first responders is a clinically relevant question about which we have limited research. Because first responders have multiple unique risk factors for both PTSS and sleep disturbance, the investigation of variables that may be protective against these risk factors merits exploration. Understanding the relationship between stressors, resilience, posttraumatic cognitions, and sleep could provide potential points of intervention for clinicians to either increase resilience or provide cognitive interventions in order to improve sleep. Thus, the purpose of this study is to determine the relationships between these variables in a sample of first responders. More specifically, the purpose of the present study is to test a moderated mediation model and a parallel moderated mediation model predicting sleep disturbance from resilience mediated by posttraumatic cognitions in a sample of first responders, with this indirect effect expected to be

most pronounced for experiencing higher duty-related stress. Given past evidence that resilience is associated with better sleep, I hypothesize that in this population, resilience will predict lower sleep disturbance. Because resilience has been shown to be protective in the face of stress and trauma, I predict that resilience will predict lower total posttraumatic cognitions and will predict lower sleep disturbance indirectly via total posttraumatic cognitions. In addition, to test whether specific subtypes of posttraumatic cognitions play a unique role in mediating the resilience-sleep link, I will examine a parallel mediation model examining the unique mediating effects of negative thoughts about the self, the world, and self-blame. Lastly, because adversity may amplify the effects of resilience, I predict that the negative effects of resilience on posttraumatic cognitions, and indirectly on sleep disturbance, will be stronger in the context of higher levels of duty related stressors (moderation).

Chapter 2: Method

Participants

Participants included 127 first responders from two fire departments in the Pacific Northwest (14 female identifying, 113 male identifying). Participants ranged in age from 23-68 years ($M = 40.73$, $SD = 8.70$) and self-identified ethnicities (African American = 1, Asian American = 1, Latinx = 3, Caucasian = 122), as well as years of service, ranging 1 year to 43 years ($M = 17.68$, $SD = 8.22$).

Sample

Preacher, Rucker, and Hayes (2007) conducted power simulations for testing moderated mediation models. Their results suggested that, assuming medium-sized effects and an alpha of

.05, a sample size of $N = 100$ would yield expected power of over .94. The actual sample size was 127.

Procedure

Prior to data collection, this study was approved by the Seattle Pacific University Institutional Review Board. This study was part of a larger research project where data was collected at three time points. Following the informed consent process, participants received an email link to complete surveys through Qualtrics assessing trait resilience, duty related stress, posttraumatic cognitions, sleep quality, and a range of constructs not germane to the present study.

Measures

Posttraumatic Cognitions Inventory

The posttraumatic cognitions inventory (PTCI) assesses trauma related thoughts and beliefs (Foa et al., 1999). The PTCI is a 33-item measure of negative cognitions related to overall PTSS severity (Blain et al., 2013). The PTCI has been shown to have a three-factor structure in exploratory factor analysis, and reflected by the three subscale structure including: (a) negative cognitions about the self (21 items; e.g., “I am inadequate”), (b) negative cognitions about the world (7 items; e.g., “people can't be trusted”), and (c) self-blame (5 items; e.g., “The event happened to me because of the way I acted”). Each item is rated on a seven-point, Likert-type scale from: 1 (*totally disagree*) to 7 (*totally agree*). Higher scores suggest stronger negative trauma related cognitions (Blakey et al., 2020). The PTCI has been shown to have good internal consistency reliability ($\alpha = .86 - .97$; Beck et al., 2004). The PTCI has demonstrated high convergent validity with other traumatic cognition measures, good sensitivity (.78) and

specificity (.93) in predicting/discriminating the presence of PTSD diagnosis, and good test-retest reliability (.75 - .86; Beck et al., 2004; Foa et al., 1999). The Cronbach's alpha internal consistency score for this sample was high ($\alpha = .94$).

Pittsburg Sleep Quality Index

The Pittsburg Sleep Quality Index is a self-report questionnaire that assesses seven components of sleep quality during the previous month including: sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction (PSQI; Buysse et al., 1989). The PSQI provides a component score for each of these subsections, as well as a global summed score. The PSQI includes: 19 self-report items rated on a 4-point, Likert type scale with varied anchors. The PSQI has demonstrated good validity, test-retest reliability, and good internal consistency ($\alpha = .70 - .83$) for the seven component scores (Buysse et al., 1989; Mollayeva et al., 2016). The PSQI has also been shown to have good concurrent validity with lab values from polysomnography. An individual is considered a good sleeper when scoring less than 5, and a poor sleeper when scoring higher than 5; however, current research has shown that the cut off scores may vary due to individual differences and presenting problems (e.g., 5 for students, 6 for adults, 8 for adults with a TBI, etc.). The Cronbach's alpha internal consistency score for this sample was ~~($\alpha = .63$)~~.

Connor Davidson Resilience Scale

The Connor-Davidson Resilience Scale is a self-report measure of trait psychological resilience (CD-RISC; Connon & Davidson, 2003). The CD-RISC is a 25-item measure, with each item rated on a 5-point Likert scale from: 0 (*not true at all*) to 4 (*true nearly all of the time*). The CD-RISC provides a summed score between 0-100 with high scores indicating higher trait

resilience. It has demonstrated good internal consistency reliability ($\alpha = .89$) in the general population (Connon & Davidson, 2003). Mean resilience levels have been shown to vary due to culture and context; however, in a nonclinical sample of combat veterans a mean of 83.4 was found (Morey et al., 2008). The mean for the current sample was 78.31 and the Cronbach's alpha internal consistency score for this sample was .92.

Duty Related Stress Measure

A self-report measure was used to evaluate the stress associated with duty related incidents or occupational trauma exposure (Beaton et al., 1989). Participants rated the stressfulness of 33 incident stressor items or situations on a 100-point scale (e.g., "Render aid to seriously injured child"), with anchors at 0 (*not stressful at all*), 50 (*somewhat stressful*), and 100 (*extremely stressful*). Participants were also asked to indicate how many times they had experienced each event in the past six months. Beaton et al., found that this measure had a 5-factor structure (catastrophic injury to self or co-worker, gruesome victim, rendering aid to a vulnerable or seriously injured victim, minor injury to self, and exposure to death or dying) in a principal components analysis (1989). These 5 factors contained 64% of the variance in a sample of 173 first responders (Beaton et al., 1989). In this study the DRISM measure had a Cronbach's alpha internal consistency score for this sample was $(\alpha = .91)$.

Planned Analyses

Prior to testing the proposed hypotheses, I planned to screen data and conduct descriptive analysis. All analyses were to be conducted in R studio with R version 3.5.3 beta0.6 (RStudio Team, 2020; R Core Team, 2013) using packages including tidyverse (Wickham et al., 2019),

psych (Revelle, 2019), ggplot 2 (Wickhan, 2009), process (Hayes, 2012), and corrplot (Taiyun, & Viliam, 2017). Missingness was also explored, and no data were found to be missing.

To test the core hypotheses, I planned to conduct conditional process analysis in R Studio (RStudio Team, 2020) using the R package ‘process’ (Hayes, 2012), yielding two models. The first analysis evaluated a simple mediation model (Model 4 in PROCESS) predicting sleep disturbance (Y) from trait resilience (X) mediated by post traumatic cognitions (M). Second, I tested a parallel moderated mediation model (Model 7 in PROCESS) predicting sleep disturbance (Y) from trait resilience (X), via multiple mediators (posttraumatic cognitions about the self [M1], posttraumatic cognitions about the world [M2], and posttraumatic cognitions about the self [M3]); with duty related stress (W) moderating the “a” paths (resilience to posttraumatic cognitions) to examine those interactions as well as moderated mediation effects (whether the indirect effect of resilience on sleep would vary based on stress levels). Significance of effects was tested with 1000 bootstrapped confidence intervals.

Chapter 3: Results

Preliminary Analyses

Prior to testing hypotheses, data were screened for normality including skew, kurtosis, normality, linearity, and outliers. Data were visualized with histogram plots and all results that suggested skew and kurtosis within the bounds considered to be normally distributed. Missingness was also evaluated; however, there were no data missing. Descriptives and correlation analyses were run for all variables (see Table 1). Bivariate correlations, means, and SDs are shown in Table 1; results from the simple mediation are shown in Table 2; and the results from the parallel mediation are shown in Table 3. As expected, trait resilience correlated

negatively with posttraumatic cognitions and sleep disturbance in zero-order associations (correlational coefficients are shown in Table 1).

Table 1*Means, Standard Deviations, and Correlations with Confidence Intervals*

Variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1. DRISM	41.65	17.18						
2. PTCI Total	67.71	22.95	.04 [-.14, .21]					
3. CD RISC	78.31	11.49	-.11 [-.28, .06]	-.52** [-.64, -.38]				
4. PSQI	7.76	3.95	.06 [-.12, .23]	.37** [.21, .51]	-.30** [-.45, -.13]			
5. PTCI (self)	1.56	0.63	.10 [-.07, .27]	.92** [.88, .94]	-.59** [-.70, -.47]	.39** [.23, .53]		
6. PTCI (world)	2.92	1.20	-.10 [-.27, .07]	.78** [.70, .84]	-.24** [-.40, -.07]	.23** [.06, .39]	.50** [.35, .62]	
7. PTCI (self-blame)	1.61	0.65	.09 [-.09, .26]	.66** [.55, .75]	-.36** [-.50, -.20]	.26** [.09, .42]	.59** [.46, .69]	.35** [.19, .50]

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * $p < .05$. ** $p < .01$.

Analyses

The first mediational model tested the direct and indirect paths from resilience to sleep disturbance mediated by total posttraumatic cognitions (Model 4). As hypothesized, resilience significantly predicted lower levels of total posttraumatic cognitions, and post traumatic cognitions predicted higher levels of sleep disturbance even after accounting for resilience levels (see Figure 1 and Table 2). Additionally, after accounting for the indirect effect, there was not a significant direct effect of resilience on sleep disturbance, implying mediation. As predicted, the test of the indirect effect showed that zero was not included in 95% bootstrapped CIs. In line with my hypothesis, these results suggest that posttraumatic cognitions mediated the relationship between resilience and sleep disturbance.

Figure 1.

Mediation Model

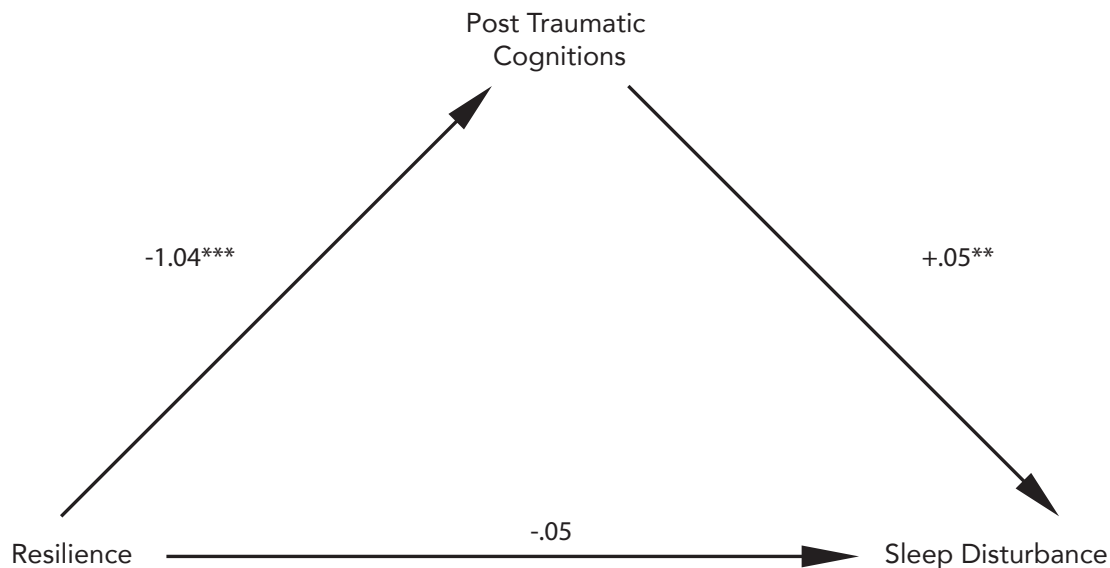


Table 2*b, SE, and Confidence Intervals for Mediation Model*

Variable	<i>b</i>	<i>SE</i>	95% Confidence Intervals [Lower, Upper]
Resilience → PTCI (a path)	-1.04	0.15	[-1.34, -0.74] ***
PTCI → PSQI (b path)	0.05	0.017	[0.02, 0.08]**
Direct effect (c')	-0.05	0.03	[-0.11, 0.02]
Indirect effect (a*b path)	-0.05	0.02	[-0.10, -0.01]

Note. * $p < .05$, ** $p < .01$., *** $p < .001$

Using Hayes' PROCESS (Model 7), I tested the moderated parallel mediation model to examine specificity of mediation effects of resilience on sleep disturbance via unique variance in posttraumatic cognitions, as well as to determine whether duty related stress moderated effects of resilience (see Table 3 and Figure 2). As predicted, higher levels of resilience predicted significantly lower levels of posttraumatic cognitions about the self, the world, and self-blame. Similarly, post traumatic cognitions about the self also predicted higher levels of sleep disturbance. However, unexpectedly, neither posttraumatic cognitions about the world or self-blame significantly predicted sleep disturbance.

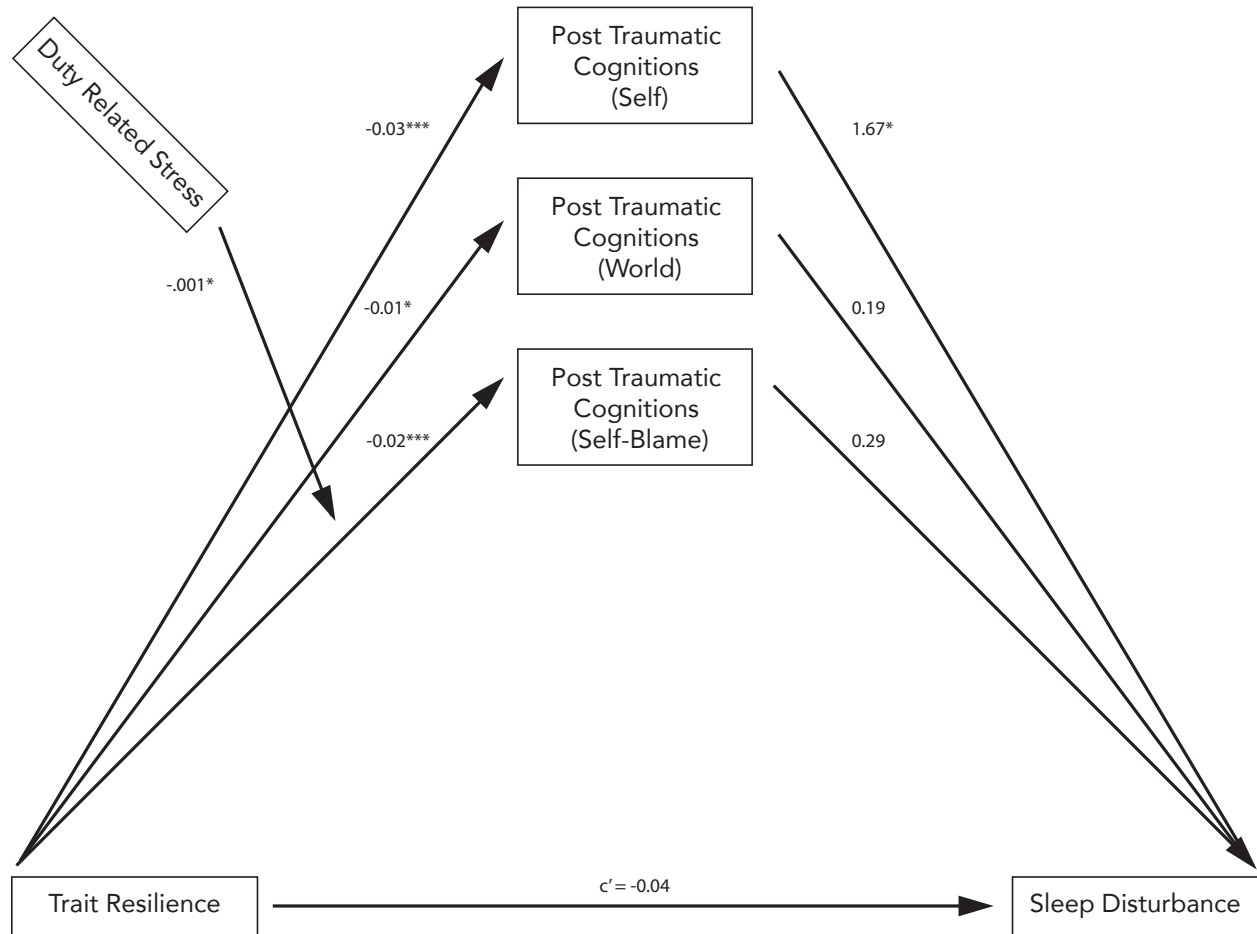
Table 3*b, SE, and Confidence Intervals for Parallel Moderated Mediation Model*

Variable	<i>b</i>	<i>SE</i>	90% Confidence Intervals [Lower, Upper]
CD RISC → PTCI (self; path a1)	-0.031	0.004	[-0.380, -0.025]***
DRISM → PTCI (self)	0.002	0.003	[-0.003, 0.006]
CD RISC * DRISM	-0.0004	0.0003	[-0.001, 0.001]
CD RISC → PTCI (world; path a2)	-0.024	0.009	[-0.039, -0.008]*
DRISM → PTCI (world)	-0.078	0.006	[-0.018, 0.002]
CD RISC*DRISM	-0.001	0.001	[-0.002, 0.0002]
CD RISC → PTCI (self-blame; path a3)	-0.017	0.005	[-0.025, -0.009]***
DRISM → PTCI (self-blame)	0.003	0.003	[-0.002, 0.008]
CD RISC*DRISM	-0.001	0.0003	[-0.001, -0.0003]**
PTCI (about the self)→PSQI	1.67	0.800	[0.035, 2.99]*
PTCI (about the world)→PSQI	0.193	0.317	[-0.331, 0.719]
PTCI (self-blame)→PSQI	0.287	0.624	[-0.748, 1.322]
Index of Moderated Mediation	Index	<i>SE</i>	[Lower, Upper]
CD RISC → PTCI (self) → PSQI	-0.001	0.001	[-0.002, 0.0001]
CD RISC → PTCI (world) → PSQI	-0.0001	0.0004	[-0.001, 0.0003]
CD RISC → PTCI (self-blame) → PSQI	-0.0002	0.0006	[-0.001, 0.001]
DRISM Simple Slopes			
Moderating Posttraumatic Cognitions (self-blame)	<i>b</i>	<i>SE</i>	[Lower, Upper]
DRISM 16th percentile	-0.003	0.008	[-0.017, 0.010]
DRISM mean	-0.018	0.004	[-0.026, -0.010]
DRISM 84 th percentile	-0.031	0.006	[-0.041, -0.021]

Note. * $p < .05$, ** $p < .01$., *** $p < .001$

Figure 2.

Parallel Moderated Mediation Model



Furthermore, with regard to interaction hypotheses, duty related stress significantly moderated the relationship between resilience and self-blame. Simple slopes analysis showed that at the mean and high levels of the moderator (duty related stress) resilience significantly predicted lower levels of self-blame, but at low levels of duty related stress the relationship was not significant (see Table 3). Duty related stress did not significantly predict posttraumatic cognitions. In line with my hypotheses, resilience was more predictive of lower self-blame related cognitions in the context of higher duty related stress, suggesting a buffering effect. With all terms in the model none of the unique indirect effects of resilience on sleep disturbance (via specific posttraumatic cognitions subscales) were significant. This suggests that after controlling for shared variance in posttraumatic cognitions, what remained was not important for accounting for the resilience-sleep relationship. Moreover, no conditional indirect (i.e., moderated mediation) effects were significant, suggesting that duty-related stress did not moderate the indirect effects of resilience on sleep disturbance, despite moderating the effect of resilience on posttraumatic cognitions about self-blame.

Chapter 4: Discussion

Within the demanding occupational context of first responders, a better understanding of the relationships between stress, resilience, posttraumatic cognitions, and sleep disturbance may provide valuable information. This is especially due to the uniquely high physical and mental demands of this profession, as well as the need for context specific interventions that may be protective against sleep disturbance. Past research regarding these relationships in this population has been sparse. The results of this study contribute to the first responder literature and were consistent with previous theories and research that trait resilience may be protective in terms of

sleep outcomes, and suggest that this effect may operate, in part, through posttraumatic cognitions. These results extend previous research results showing that trait psychological resilience was significantly associated with mental health and sleep outcomes that are critical to the well-being of first responders.

Resilience and Sleep

Previous research has reported a positive association between trait psychological resilience and sleep outcomes in the general population (McClelland, 2016), but little research has examined this relationship in the context of first responders. The results of this study are comparable to previous cross-sectional research showing that greater trait psychological resilience was associated with lower levels of PTSD symptoms (measured with the Posttraumatic Stress Disorder Checklist–Civilian; PCL-5) in a sample of 125 paramedics (Blevins et al., 2015; Straud et al., 2018). Straud et al. (2018) found that trait resilience (measured similarly with the CDRISC) predicted significantly less sleep disturbance measured with the PSQI. The findings of the current study thus replicated this relationship and extended it to a different first responder population. Although the research remains correlational, it is consistent with a model in which resilience might have downstream positive impact on sleep. One potential hypothesis is that those individuals that are higher in resilience are less prone to develop or hold the sort of threatening cognitions—in the wake of traumatic experiences—that might lead to heightened cognitive or physiological arousal that could inhibit restful nighttime sleep, in line with our tests of the relationship between resilience and posttraumatic cognitions.

Resilience and Posttraumatic Cognitions

In line with the hypothesis, the results of this study also showed that those higher in resilience experienced lower posttraumatic cognitions, pointing to a possible mechanism in the relationship between resilience and sleep disturbance. Previous research in the general population and a sample of paramedics has shown that higher levels of trait resilience was negatively associated with PTSD (Straud et al., 2018; Connor & Davidson, 2003; Wrenn et al., 2011); however, this relationship has not been examined in the context of first responders, specifically examining posttraumatic cognitions. People high in trait resilience are thought to possess high standards and tenacity, to trust their instincts, to tolerate negative affect, and to endorse becoming stronger in the face of stress (i.e., items or subscales of the CD-RISC). Thus, it may be that trait resilience serves as a marker for adaptive beliefs and abilities that might protect the individual to some extent when adversity arises. The present study implies, moreover, that highly resilient individuals may be less likely to become stuck in negative beliefs about the self or others, or to make pervasive attributions blaming one's self for traumatic events experienced. This also might account for why past studies have linked resilience to lower PTSD and PTSS.

Sleep and PTSS

The results of this study also indicated that posttraumatic cognitions predict increased sleep disturbance. Previous studies have shown that cognitive processes including cognitive representations of negative or stressful events play a role in the development and maintenance of sleep disturbance in the general population (Li et al., 2019; Pillai & Drake, 2015). Further, previous literature demonstrated that cognitive arousal (multiple types of cognitive activity including rumination and worry) immediately before bed was significantly connected to sleep

disturbance (more nighttime awakenings, high latency, lower efficiency, and lower duration) in the general population and those diagnosed with insomnia (relationships were stronger in those diagnosed with insomnia; Kalmbach et al., 2020). Straud et al. (2012), found similar associations between sleep and PTSD symptoms in the context of first responders. However, Straud et al., showed that sleep predicted increased PTSD as measured with the civilian version of the PCL-5 which assesses all symptoms of PTSD and does not focus on cognitive symptoms (2018). While the direction of the pathways found in this study and those of Straud et al. (2018), are modeled in opposite directions, they nonetheless establish the link between these processes.

Additionally, previous research in the general population and combat veterans yielded findings consistent with a bidirectional relationship between sleep and PTSS (Cox et al., 2017; Miller et al., 2019), in which PTSS causes sleep disturbance and sleep disturbance may also increase PTSS symptoms. Although the present study's correlational design cannot ascertain the causal direction, it remains similarly plausible that the relationship between sleep disturbance and posttraumatic cognitions is bidirectional in first responders, such that posttraumatic cognitions impair sleep, and sleep disturbance may also exacerbate difficulties in regulating negative cognitions or perseverative thoughts about traumatic experiences. In any case, the present findings add to the first responder literature by linking constructs of posttraumatic cognitions in particular to sleep disturbance in this unique population. Future research should explore the possibility of bidirectional relationships and should also determine which specific aspects of sleep disturbance are associated with posttraumatic cognitions within first responder populations.

Pathway from Resilience to Sleep through Posttraumatic Cognitions

Beyond linking resilience to cognitions and cognitions to sleep, the present findings provide initial evidence that the relationship between resilience and sleep was significantly mediated by posttraumatic cognitions in this unique population of first responders. Previous research has also documented multiple relationships between these variables. Cross-sectionally, trait psychological resilience was related to lower rumination and sleep disturbance in a sample of college students (Li et al., 2019). Additionally, positive outcomes have been associated with increased levels of resilience in the context of workplace stress and trauma exposure (Arrogante & Aparicio-Zaldivar, 2017; Russell et al., 2019). However, the results from this study are the first of its kind looking specifically at the relationship between sleep disturbance, resilience, and posttraumatic cognitions within this population. Straud et al. (2012), found that sleep disturbance mediated the relationship between resilience and PTSD in the context of first responders, suggesting a different theorized causal model of how trait resilience might exert downstream effects. In that model, resilience was modeled as directly impacting sleep, which may increase risk for PTSD symptoms. In the present study, the mediating effect of posttraumatic cognitions introduces an additional factor (a cognitive mechanism) that might explain why Straud et al. found links of trait resilience to sleep. Ultimately, as noted, there likely exist feedback loops and bidirectional relationships between these variables, meriting further future inquiry.

Parallel Moderated Mediation Model Findings

The results of the parallel moderated mediation model provided additional nuance in understanding the links between resilience, cognitions, and sleep. Further, these results provide additional insight into the relationships between each of the three posttraumatic cognitions

subscales, resilience, duty related stress, and sleep disturbance within the first responder population. First, this more complex model delineated specific types of posttraumatic cognitions. Results showed that when the three subscales of posttraumatic cognitions were separated (self, world, self-blame), resilience significantly predicted all subscales, consistent with but also adding information beyond the finding of resilience predicting total post traumatic cognitions in the simple mediation model. It appears that trait resilience has several links to cognitive processes common in first responders with repeated trauma exposure. This association may merit additional research to determine whether there are specific types of resilience associated with specific types of cognitive processes. The CDRISC (measure of trait resilience) has been shown to have a 5-factor structure (personal competence, trust in oneself, acceptance in relationships, sense of control, and spirituality; Connor & Davidson, 2003). One hypothesis specific to first responders would be that the control factor of resilience may not be as protective, because the lack of control in first responder trauma exposure is inherent to their duties and has been shown to be detrimental (Skogstad et al., 2015); on the other hand, perceived control is often more important than actual control—in terms of psychological outcomes—and a subjective sense of control even amidst a somewhat unpredictable occupational context may play a role in reducing posttraumatic cognitions. Other CDRISC factors such as trust in oneself and relational connections may directly help make sense of why resilience predicted lower scores on posttraumatic negative cognitions related to both the self and the world. Moreover, spirituality may provide a means to make sense of unpredictability and negative or unjust events in one's community, providing a cognitive framework for absorbing and integrating traumatic information without it necessarily leading to perseverative negative cognitions. Future research

may be beneficial to consider specifically which factors within the CDRISC are most protective in the face of trauma related cognitions.

Posttraumatic Cognitions (Self) and Sleep

While resilience significantly predicted all posttraumatic cognitions subscales, only posttraumatic cognitions about the self uniquely and significantly predicted sleep disturbance when all terms were in the model. The posttraumatic cognitions about the self subscale includes 21 items intended to measure negative self-views of ineptitude, isolation, hopelessness, distrust of the self, and negative beliefs about one's symptoms (Foa et al., 1999). Previous research has shown that in the general population, adults with a history of sexual assaults score significantly higher on this particular subscale than other categories of trauma exposure. Additionally, this subscale is associated with increased distress, decreased psychosocial functioning, and increased symptom severity (Lyons et al., 2020; Lancaster et al., 2011; Moser et al., 2007). In the general population the reverse has also been shown to be true; positive cognitions about the self have been shown to be associated with improved sleep. More specifically, increased self-esteem has been shown to be correlated with decreased sleep disturbance and increased sleep duration (Lemola et al., 2013). Overall, research performed in the general population has shown that higher scores on the negative cognitions about the self subscale has been associated with sexual trauma, distress, psychosocial functioning, and symptom severity (Lyons et al., 2020). However, to determine whether these findings generalize to the unique context of first responders, it was important to test such associations directly.

The unique link from negative cognitions about the self predicting sleep disturbance was found in this study. One hypothesis regarding this result is that the culture of first responders

may be influencing this outcome. Within the first responder culture there is intense pressure to perform competently under pressure, appear confident, and demonstrate mental and physical strength (Fay et al., 2006). First responder cultural pressures may increase anxiety or fears of not appearing strong and capable, leading to increased negative cognitions about the self after trauma exposure. Specifically, these cultural expectations could lead to increased distrust of the self, ineptitude, and negative beliefs about one's symptoms within this subscale, without necessarily increasing other PTC factors such as self-blame about trauma or negative views of other people. Further research is needed to determine if these results are replicable, which scale items associated with posttraumatic cognitions about the self in the PTCI are most salient to first responders, and if cultural pressures could be influencing negative posttraumatic cognitions about the self. Nonetheless, comparing the single and parallel mediation models' finding about posttraumatic cognitions predicting sleep suggests that shared variance among forms of posttraumatic cognitions is central, but after accounting for that common variance only negative cognitions about the self played a unique role.

DRISM as a Moderator

The more complex moderated mediation model also provided additional nuance by examining interactions of resilience with duty related stressors. Namely, the effect of resilience on the self-blame subscale (but not other posttraumatic cognitions) was significantly moderated by duty related stress. The posttraumatic cognitions self-blame subscale was designed to assess blame specifically for the traumatic incident (Foa et al., 1999; Lyons et al., 2020). At the mean and high levels of duty related stress the relationship between resilience and posttraumatic cognitions around self-blame was increasingly more negative, whereas this link was not

significant at low levels of duty related stress. In other words, resilience was not predictive of sleep when duty related stress was very low; but at average stress levels and especially high work stress, resilience was more protective against self-blame cognitions (playing a buffering role).

The self-blame subscale has been hypothesized to be influenced by the type of trauma that one has experienced; previous studies have shown that those experiencing trauma from vehicular accidents tend to score lower on this subscale as they generally do not blame themselves (Startup et al., 2007). Higher scores on the self-blame subscale have been shown to be associated with specific types of trauma including interpersonal trauma like sexual assault (Foa et al., 1999; Lyons et al., 2020). In the context of combat related trauma, self-blame has also been shown to be associated with increased and more severe PTSS, anxiety and depressive symptoms, as well as developmental experiences of trauma (Dorresteijn et al., 2019). As discussed above, posttraumatic cognitions about self-blame specifically indicate that the individual is blaming themselves for the cause of the traumatic event. The results of this study suggest that as duty related stress increases, those first responders higher in resilience experienced less likelihood of blaming themselves specifically for traumatic incidents. One potential reason for this finding could be that as duty related stress rises, first responders may be more resilient because they attribute the trauma to external duty related stressors and less to their fault. While this study did not look specifically at attributions or attribution theory, there may be a link between the literature on attribution theory and posttraumatic cognitions about the self-blame. Attributions or cognitions regarding the cause of events, including self-blame for stressful events are rated in the literature on three different dimensions; internal or external, stable or unstable, and global or specific (Reiland et al., 2014). Currently, the relationships between

attributions and posttraumatic cognitions remains unclear with mixed results (depending on the type of trauma) and no research on this topic exists within the first responder population.

However, it is commonly hypothesized that more stable and internal attributions (e.g., self-blame) may relate to increased PTSS including sleep disturbance (Reiland et al., 2014).

Additional research is needed to determine if these results are replicable, to determine whether the type of trauma exposure or factors of resilience influences results, and what other constructs may be contributing to duty related stress significantly moderating the relationship between resilience and internal attributions about the traumatic event (self-blame).

In contrast to hypotheses, DRISM did not significantly moderate the relationship between resilience and the self and world posttraumatic cognitions subscales. One potential explanation could be that the amount of stress in the line of duty does not change the relationship between trait resilience and cognitions about the self and the world because those beliefs are more stable while duty related stress is transient. Additional research may benefit from examining this relationship in a larger and more diverse sample may be beneficial.

Indirect Effects

The results showed that indirect effects were not significant when posttraumatic cognitions were separated into the three subcategories. This may reflect either a lack of power or the importance of the total posttraumatic cognitions. The zero-order correlations suggest moderate overlap between PTCI subscales, making it likely that unique indirect effects would have smaller effect sizes and thus be harder to detect in a medium-sized sample. Moreover, the presence of high duty related stress did not moderate or change the indirect effects of resilience on sleep via specific posttraumatic cognitions. Nonetheless, the mediation by total posttraumatic

cognitions was consistent with our hypothesized model of such processes as one potential mechanism linking resilience and sleep. Further research with larger samples must examine unique effects of subtypes of posttraumatic cognitions.

Clinical Implications

These results suggest the possibility that resilience may have downstream relevance for cognitions in the wake of traumatic events and for sleep. Because resilience can be enhanced, these results may provide an important and additional point of intervention to improve sleep quality in this population as sleep disturbance has been shown to have particularly detrimental effects (relationship impairment, decreased wellbeing, increased health risks, etc.), especially in those with PTSS (Babson et al., 2011; Babson et al., 2012; Cheng et al., 2018; Gayton & Lovell, 2012). Because repeated trauma exposure with limited perceived control is inherent in the duties of a first responder and cannot be avoided, interventions targeting increased trait resilience may be of particular importance as a potential way to mitigate the downstream detrimental effects on sleep (Skogstad et al., 2015).

Resilience has been shown to be enhanced in a multitude of different ways and there is not yet a robust consensus about what is considered resilience training nor what is most successful in the general population to improve resilience (Leppin, 2014). Interventions designed to increase resilience have historically been most often utilized in performance populations such as elite athletes and military service members in order to help these individuals withstand intense pressure and perform optimally. First responders similarly experience high pressure and are expected to perform well under this pressure. However, there is less research examining the effect of resilience interventions in first responders. In a meta-analysis, results

suggested that few interventions were successful with first responder populations and those that were shown to have positive outcomes were longer, more frequent, as well as those that contained imagery and physical movement (Wild et al., 2020a; Wild et al., 2020b). However, this meta-analysis also concluded that it was difficult to determine the efficacy of such interventions as there were little to no longitudinal research, follow ups, or extended interventions (Wild et al., 2020a). Future studies examining different types of resilience interventions specifically with first responders may be beneficial, especially those with a longitudinal design.

In other performance populations, Fletcher and Sarkar (2016), recommend a resilience training program targeting personality characteristics (less malleable but still targeted; optimism, conscientiousness, intrinsic motivation, task orientation, attributional style, etc.), cognitive and affective psychological skills (awareness, confidence, self-talk, goal-setting, imagery, attentional training, preparation routines and plans, self-serving attributional styles, arousal control, etc.), and desired outcomes (intrinsic motivation, self-determination, emotional regulation, self-efficacy, emotional intelligence, communication, automaticity, etc.) that can be individualized to the specific context. Fletcher and Sarkar (2016) also caution that the context including social, cultural, organizational, and situational factors exert great influence over the development and maintenance of increased resilience. They suggest that highly supportive and challenging environments (those that encourage ownership, relationships, constructive feedback, healthy competition, growth mindset, and psychological safety) are the most facilitative of resilience building. Resilience is does not develop within the individual in a vacuum (Fletcher & Sarkar, 2016)—as if it lives “inside” the skin with no connection to social or cultural context. In the

context of first responders, that would mean that interventions focused solely on an individual's internal development of resilience would not be as successful as those implemented more holistically, targeting social, organizational, cultural, leadership, political, economic, and diversity factors that exert influence on the individuals within those contexts as well as the development of those personality characteristics and psychological skills associated with resilience.

Limitations and Future Directions

There are several limitations of this study including the exclusion of various details around the types of trauma exposure (frequency, degree, type, and characteristics of the trauma exposure). More specifically, participants were not asked to disclose previous developmental trauma or prior psychopathology. Because the culture of first responders is so unique, the inclusion and measurement of additional data regarding cultural beliefs would be beneficial; especially in the interpretation of these findings. Additionally, there were minimal participants from diverse backgrounds and few that described their gender identity other than male. Finally, as is common with research on unique populations, the study relied on a cross-sectional and correlational design. Future studies may benefit from additional and diverse participants, longitudinal designs, as well as the inclusion of more details around the trauma exposure and cultural pressures. Intervention studies designed to improve resilience in the first responder population may also merit exploration.

Conclusion

While trait psychological resilience has consistently been associated with the mitigation of negative outcomes and increasing positive outcomes, the mechanisms of this relationship have

not been well understood especially within the first responder population. While it is likely that many pre- and post-trauma individual differences interact to impact the vulnerability or resilience of first responders in the face of repeated trauma exposure, this study provides some preliminary evidence that resilience may be protective against posttraumatic cognitions and disturbed sleep. Posttraumatic cognitions appear to function as a mediator between resilience and sleep disturbance, suggesting the possibility that therapeutic interventions seeking to improve resilience—and particularly those that also reduce post traumatic cognitions—might improve the quality of sleep in the lives of first responders.

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