The Role of Sleep in the Health and Resiliency of Military Personnel

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1.0 SUMMARY

Sleep is a naturally-occurring circadian behavior essential to both physical and psychological functioning. Profound negative consequences can result from sleep disruption and deprivation. Military service members face unique challenges to restful sleep, especially during deployment. The consequences of sleep deprivation on the functioning of the individual and, in turn, on his or her military unit can be catastrophic. Following deployment, continued sleep disturbance can complicate reintegration back into family, social, and work activities.

How military service members and their families become resilient and positively adapt to or recover from the stressors of repeated and dangerous deployments is of great importance to military leaders seeking to optimize the health of the military forces. The role of sleep in resiliency has not been widely considered; however research suggests that sleep may play an essential role in developing and supporting resiliency. A model for resilience patterned after Maslow's Hierarchy of Needs is proposed. Gaps in our understanding of the role of sleep in the health and resiliency of military personnel are discussed.

2.0 INTRODUCTION

Although restful sleep is recognized as essential for good health, it is puzzling that so little is known about this activity, especially as it relates to psychological resiliency. Sleep is a naturally-occurring circadian behavior that is believed to be a restorative process essential for normal metabolic function (Morin, 1993; Pressman & Orr, 1997; Ropper & Samuels, 2009). Sleep is an essential component of both physical and psychological functioning that promotes health as well as resilience to adversity. This is especially true in

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14. ABSTRACT
Sleep is a naturally-occurring circadian behavior essential to both physical and psychological functioning. Profound negative consequences can result from sleep disruption and deprivation. Military service members face unique challenges to restful sleep, especially during deployment. The consequences of sleep deprivation on the functioning of the individual and, in turn, on his or her military unit can be catastrophic. Following deployment, continued sleep disturbance can complicate reintegration back into family, social, and work activities. How military service members and their families become resilient and positively adapt to or recover from the stressors of repeated and dangerous deployments is of great importance to military leaders seeking to optimize the health of the military forces. The role of sleep in resiliency has not been widely considered; however research suggests that sleep may play an essential role in developing and supporting resiliency. A model for resilience patterned after Maslows Hierarchy of Needs is proposed. Gaps in our understanding of the role of sleep in the health and resiliency of military personnel are discussed.

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the military where sleep deprivation can have profound negative consequences on both individual performance as well as unit functioning.

There are myriad characteristics of military service that disrupt normal sleep including early work start times and late work stop times; long work hours; irregular work schedules; and caffeine, tobacco, and alcohol use. During deployments, additional distracters and disruption from normal sleep include hazardous working conditions, extreme temperatures, loud noises, continuous operations, and an overall lack of control over the sleeping environment (Moore & Krakow, 2009; Peterson, Goodie, Satterfield & Brim, 2008). One of the most common observations of service members both during and following deployment is disturbed sleep (McLay, Klam, & Volkert, 2010). Over the past ten years of continuous military operations in Iraq and Afghanistan, the issue of sleep disturbance has become more urgent especially when considered with other behavioral health concerns such as posttraumatic stress, anxiety, depression, and suicide (Armed Forces Health Surveillance Center, 2010a).

3.0 REVIEW OF LITERATURE

3.1 Normal Sleep & the Impact of Sleep Disturbance

Sleep is a naturally-occurring circadian behavior that is believed to be a restorative process essential for body restitution, facilitation of motor function, and consolidation of learning and memory (Ropper & Samuels, 2009). There are five distinct stages of sleep. Stages 1, 2, 3, and 4 are collectively called non-rapid eye movement (NREM) sleep. The fifth stage is labelled REM sleep. Each of the sleep stages occurs several times during normal sleep in cycles lasting approximately 90 minutes (Ropper & Samuels, 2009). During NREM sleep, the EEG becomes progressively more synchronized and temperature drops, as does heart rate, blood pressure, and respiratory rate. REM sleep is characterized by the sudden onset of an asynchronous EEG pattern. Very little muscle movement occurs during REM sleep, except for muscle twitches of the face and the eyes. Sleepers awakened from REM sleep typically report dreaming. Some of the most commonly used terms in the assessment and treatment of sleep disorders are included in Table 1.

Sleep deprivation can have profound negative consequences. Humans deprived of sleep for more than 48 hours experience increasing levels of fatigue and irritability, have increased difficulty concentrating, and undergo a deterioration of motor coordination (Ropper & Samuels, 2009). Symptoms of sleep deprivation can be very similar to psychiatric disorders including lack of self-care, poor work initiative, lapses of attention, impaired judgement, and withdrawal. The chance for errors and accidents increases. Illusions and hallucinations are possible. Neurological signs of abnormal eye movements and speech can also occur. Seizure threshold is lowered and psychotic episodes are possible (Ropper & Samuels, 2009). When recovering from sleep deprivation, the amount of time spent in the various stages of sleep is altered. Initially stage 4 sleep predominates. On succeeding nights, REM sleep rebounds. Stage 4 sleep is believed to be the most important stage in restoring normal daytime functioning (Ropper & Samuels, 2009).

The primary symptoms of insomnia include difficulty initiating sleep, difficulty maintaining sleep, waking up too early, and non-restorative or poor quality of sleep. In civilian populations, research studies have estimated that approximately 30% of adult samples drawn from different countries report one or more of the symptoms of insomnia (Roth, 2007). If perceived daytime impairment or distress due to insomnia is added to the case definition, prevalence estimates decline to approximately 10%. Insomnia has been associated with higher rates of illness and decreased quality of life (Katz & McHorney, 2002; Léger, Guilleminault, Bader, Lévy & Pallard, 2002; Léger, Scheuermaier, Philip, Paillard & Guilleminault, 2001; Sateia & Pigeon, 2004). Disturbed sleep is also associated with poor job performance including difficulty performing duties and more work-related accidents (Léger, Guilleminault, Bader, Lévy & Pallard, 2002;

Pilcher & Huffcutt, 1996). Even more concerning, especially for the military, is the observation in civilian population that the frequency of nightmares has been directly related to the risk of suicide (Tanskanen et al, 2001). One study (Ozminkowski, Want & Walsh, 2007) estimated health costs for young adults with insomnia to be $1,253 greater than for individuals without insomnia.

3.2 Incidence & Impact of Sleep Disturbance in the Military

The nature of military service has a unique impact on sleep. A recent study of U.S. military personnel indicated that the rate of insomnia has increased dramatically since the start of Operation Enduring Freedom in 2001 (Armed Forces Health Surveillance Center, 2010b). The study population included all service members in the active component of the Army, Navy, Air Force, Marine Corps, or Coast Guard between 1 January 2000 and 31 December 2009. For study purposes, insomnia was defined as two or more ambulatory visits within 90 days of each other or a hospitalization including one of five different insomnia ICD-9 codes. The crude incident rate for insomnia was calculated by the number of cases per 10,000 person-years. From 2000 to 2009, the crude incidence rate of insomnia in the U.S. military increased from 7 to 136 cases per 10,000. The incidence rates increased for all service branches, but the greatest increase by far was in the Army (from 7 to 226 cases per 10,000). In addition, the evaluation of individual cases of insomnia from before to after deployment revealed that the incidence rates for insomnia increased more than 250% in the Army. Interestingly, the incidence rate of insomnia between 2000 and 2009 was higher for military health care occupations (12 to 205 per 100,000) as compared to combat military occupations (4 to 145 per 100,000). The primary limitation of this study is that it is based on ICD-9 codes from ambulatory visits or hospitalizations, rather than population samples. Whether the overall rate of insomnia in the military population as a whole is different from the rate in civilian populations is not clear.

The most recent data from the Department of Defense Survey of Health Related Behaviors (Bray et al, 2009) of 28,546 Army, Navy, Marine Corps, Air Force, and Coast Guard personnel indicated that only one-quarter (24%) reported sleeping seven or more hours of sleep per night in the past six months. If seven to nine hours of sleep each night is considered normal, 75% of the respondents are getting too few hours of sleep.

Data from the Millennium Cohort provides additional information on sleep in U.S. military personnel (Seelig et at., 2010). A survey of 41,225 military personnel from all U. S. branches of service including the Reserve and National Guard indicated that service members report sleeping an average of 6.5 hours per night. However, between 20% and 30% of the study cohort reported trouble sleeping over the past month (Seelig, Jacobson, Smith et at., 2010). The primary limitation of the sleep data from the Millennium Cohort study is that sleep habits were measured using two questions from the Posttraumatic Stress Disorder CheckList – Civilian (PCL-C) and the one question from the Patient Health Questionnaire (PHQ) related to anxiety (Seelig et at., 2010). Potentially, Millennium participants may have answered thinking of their sleep in relation to PTSD and anxiety rather than their sleep in general.

During deployment, reports of sleep disturbance increase. One study evaluated 156 Air Force personnel deployed in 2001 to an undisclosed bare-base environment in support Operation Enduring Freedom. The results indicated that 74% reported their quality of sleep was significantly worse in the deployed environment, 40% had a sleep efficiency less than 85%, and 42% took longer than 30 minutes to fall asleep (Peterson et al., 2008). The Mental Health Advisory Team (MHAT) Reports V (OTSMNC-I, OTCS & OTSG, 2008) and VI (OTSMNC-I & OTSG, 2009) do not specifically report sleep habits during deployment to Operation Enduring Freedom or Operation Iraqi Freedom, but do report the use of sleeping medications. Nine percent of Soldiers serving in Afghanistan reported using sleeping medications (OTSMNC-I, OTCS & OTSG, 2008). A similar number of Soldiers serving in Iraq as part of maneuver units (8%) reported using sleeping medications; however, 14% of Soldiers serving in support and

sustainment units reported using sleeping medications (OTSMNC-I & OTSG, 2009). This was statistically significantly different even after controlling for gender, rank, and time in theater. Support and sustainment units include medical personnel who were identified by the Armed Forces Health Surveillance Center (2010b) to have higher rates of insomnia as compared to combat occupations.

Stressors documented during deployment that prompt behavioral health intervention include sleep disturbance (Moore & Krakow, 2009). Sleep disturbance was one of the top five stressors during deployment and was the principle "other" behavioral health diagnoses recorded in almost 30% of individuals receiving care the first half of 2008 (Hung, 2008).

Upon redeployment, sleep disturbance often continues. In an electronic record review of 1,887 predominantly Navy and Marine personnel, 41% of those who had deployed to Iraq or Afghanistan reported sleep problems as compared with 25% of those who had deployed elsewhere (McLay et al., 2010). However, like the Millennium Cohort, sleep was assessed using the Navy's Post-Deployment Health Assessment Test (PDHAT) which includes all the questions from the PTSD CheckList – Military. Similarly in the Millennium Cohort, individuals who had deployed reported decreased sleep duration as compared with individuals who had never deployed (Seelig et al., 2010). Other variables significantly associated with trouble sleeping included female gender, lower reported general health, and reported mental health symptoms.

Findings from a study of 130 injured service members with extremity trauma sustained during service in Operation Enduring Freedom or Operation Iraqi Freedom indicated that 71% reported sleep disturbance three or more nights per week (Young-McCaughan, Miaskowski, Bingham, Vriend, Inman & Menetrez, 2011). Sleep disturbance was more prevalent than pain (average ≥5 and/or worst ≥7 reported by 55% of sample), depression (Center for Epidemiological Studies – Depression score ≥16 reported by 52% of the sample, anxiety (Spielberger Anxiety Scale ≥46 reported by 27% of the sample, and PTSD (PTSD CheckList – Military ≥50 reported by 19% of the sample) (Young-McCaughan, Miaskowski, Bingham, Vriend, Inman & Menetrez, 2011).

Sleep disturbance affects more than just the individual. In a study of 45 male Operation Enduring Freedom / Operation Iraqi Freedom Veterans, reports of sleep problems predicted lower marital and relationship satisfaction (Goff, Crow, Reisbig & Hamilton, 2007). Together, sleep disturbance and sexual problems predicted 29% of the variance in relationship satisfaction.

Sleep disturbance is consistently reported as most prevalent in service members with posttraumatic stress (Engel, Liu, McCarthy, Miller & Ursano, 2000; Hoge, Terhakopian, Castro, Messer & Engel, 2007; Lewis, Creamer & Failla, 2009). In one study of 2,863 Soldiers redeploying from service in Iraq (Hoge, Terhakopian, Castro, Messer & Engel, 2007), 71% of the 432 individuals reporting symptoms of PTSD on the Patient Health Questionnaire (PHQ) also reported sleep disturbance. In contrast, of the 2,180 individuals not reporting of PTSD, only 26% reported sleep disturbance. The specific type of sleep disturbance is not queried with the PHQ. The report by 26% of those without symptoms of PTSD of sleep disturbance is more than three times greater than that reported in a study of 21,244 Gulf War Veterans seeking care (Engel, Liu, McCarthy, Miller & Ursano, 2000). In the Gulf War Veterans, only 8% of 1,605 otherwise healthy individuals reported sleep disturbance, but 64% of the 1,096 individuals with PTSD reported sleep disturbance. The variability in reports of sleep disturbance could be related to the conflict (Gulf War or Operation Enduring Freedom / Operation Iraqi Freedom), military status (active duty or retired), and co-morbid medical and psychiatric conditions as well as the questionnaire used to elicit this information.

Several military programs have been developed to evaluate and treat sleep disorders in garrison and during deployments. Two in-garrison military studies indicated that insomnia can be successfully treated using cognitive behavior therapy targeting insomnia delivered in a psychoeducational group format (Hryshko-

Mullen, Broeckl, Haddock, & Peterson, 2000) as well as in an integrated behavioral health format in a primary care setting (Goodie, Isler, Hunter, & Peterson, 2009). The Walter Reed Army Institute of Research (WRAIR) has developed a sleep management system to assess and address sleep issues before and during deployments (Wesensten, Belenky & Balkin, 2006). The program, developed prior to the Iraq and Afghanistan conflicts includes the following six elements: (1) actigraphy measurement of Soldier sleep in garrison and in theatre, (2) a mathematical model to predict individual soldier's cognitive readiness as a function of his or her sleep, (3) guidelines for the use of stimulants, (4) guidelines for behavioral strategies to promote sleep, (5) guidelines for pharmacological strategies to promote sleep, and (6) guidelines and tools for monitoring performance in real time in operational environments (Wesensten, Belenky & Balkin, 2006).

3.3 Resiliency in the Military

Resiliency is traditionally a term used in mechanical engineering to describe the physical property of a material to absorb energy and change shape, then return to the original shape or position, either immediately or over time. More recently the concept has been applied to adaptive responses to psychological stress. There is a great deal of variability in the understanding of psychological resilience both in civilian and military populations (McGeary, 2011). One definition of psychological resiliency is a "dynamic process encompassing positive adaptation within the context of significant adversity" (Luthar, Cicchetti & Becker, 2000, p. 543).

Understanding and promoting resilience is of great importance to the U. S. military seeking to mediate the psychological stress of the ongoing conflicts in Iraq and Afghanistan (Casey, 2011; Peterson, Cigrang & Isler, 2009). Yet relatively little is known of the mechanisms for resilience (McGeary, 2011), factors that contribute to resilience to adversity encountered as part of military duty, or means to promote resiliency in service members. In a group of 328 U. S. Air Force medical personnel deploying to Iraq, resilience (as assessed with the Connor-Davidson Resilience Scale) was significantly correlated ($p<.05$) with low pre-deployment stress, positive military experiences, and positive affect (Maguen et al, 2008). Sleep was not assessed in this study. Conducting a secondary analysis using data collected from 1,632 male and female Veterans of Vietnam, King and his colleagues (1999) identified social support and hardiness as two key factors contributing to post-war resilience and recovery. Again, sleep was not assessed.

Despite a rudimentary understanding of resilience and the factors that support resilience, the American military has instituted a variety of programs to promote resilience for Service Members. At Fort Hood, Texas, a Resiliency Campus "dedicated to integrating the body, mind, and spirit" has been established "to ensure wellness for its Soldiers, families, and retirees" (www.hood.army.mil/ResiliencyCampus). In 2007 the Battlemind Training system (www.resilience.army.mil) was mandated to all U. S. Army units (Adler, 2009). Battlemind training focuses on ten combat skills taking a cognitive and skills-based approach to focus on safety, relationships, and common physical, social, and psychological reactions to combat (Adler, Bliese, McGurk, Hoge & Castro, 2009). In one randomized controlled trial comparing stress education to Battlemind debriefing to small group Battlemind training (18–45 individuals) to large group Battlemind training (126–225 individuals), small group Battlemind training participants with high combat exposure reported fewer posttraumatic stress symptoms and sleep problems (Adler, Bliese, McGurk, Hoge & Castro, 2009).

In 2009 the Chairman of the Joint Chiefs of Staff, Admiral Michael Mullen, commissioned the Consortium for Human and Military Performance (CHAMP) at the Uniformed Services University of the Health Sciences (USU) to develop a comprehensive Total Force Fitness program (Land, 2010; Mullen, 2010). The program describes eight domains of Total Force Fitness including physical (Roy, Springer, McNulty & Butler, 2010), psychological (Bates et al, 2010), behavioral and occupational (Bray, Spira, Olmsted & Hout, 2010), medical and environmental (O'Connor, Deuster, DeGroot & White, 2010),

nutritional (Montain, Carvey & Stephens, 2010), spiritual (Hufford, Fritts & Rhodes, 2010), social (Coulter, Lester & Yarvis, 2010), and family (Westphal & Woodward, 2010). How the program will be implemented across the services is still being considered (Land, 2010). Sleep is addressed in the physical, psychological, behavioral and occupational, and medical and environmental domains as either a key component of fitness or as an indicator of poor functioning. A program evaluation of Total Force Fitness is proposed that includes the assessment of sleep patterns (Walter, Coulter, Hilton, Adler, Bliese & Nicholas, 2010).

Most recently, the University of Pennsylvania program "Comprehensive Soldier Fitness," has been mandated across the U.S. Army. The program consists of four components including online self-assessment, an online self-help training, training of master resilience trainers, and mandatory resilience training at every Army leader school (Casey, 2011). Cornum and her colleagues (2011) acknowledged the challenge of sleep deprivation during deployment, but it is not apparent that promoting restful sleep is a component of the program. Multiple assessments of the program are on-going (Lester, McBride, Bliese & Adler, 2011).

4.0 MODEL INCLUDING SLEEP AS ESSENTIAL FOR RESILIENCE

Some research suggests that restful sleep is an essential ingredient for achieving and maintaining resilience. In a study testing the stress buffering effects of self-engagement in Soldiers deployed to Bosnia as part of Operation Joint Guard (OJG), Britt and Bliese (2003) found that hours of sleep accounted for 14% of the variance in psychological distress. Fewer sleep problems were considered a positive outcome in testing Battlemind training (Adler, Bliese, McGurk, Hoge & Castro, 2009). But, while a better and more comprehensive understanding of military resilience is emerging from current programs and ongoing research, only a few authors have deliberately considered sleep as a component of resilience (Adler, Bliese, McGurk, Hoge & Castro, 2009; Bray, Spira, Olmsted & Hout, 2010; Britt & Bliese, 2003; Cornum, Matthews & Seligman, 2011; Wesensten, Belenky & Balkin, 2006).

From the previous reviews of sleep and resilience in military personnel, sleep can be conceptualized as a base requirement for resiliency similar to air, food, and water are conceptualized as base physiological requirements for safety, love and belonging, esteem, and self-actualization in Maslow's Hierarch of Needs (Maslow, 1943). The progressive requirements for military resiliency might be physiological, psychological, knowledge and skills, and social support (see Figure 1) with sleep being one of the physiological requirements for success at succeeding tasks. Examples of research suggesting that these are essential elements for resilience are presented below.

4.1 Physiological Needs

Maslow conceptualized physiological needs as those required for human survival: air, food, and water. At its most base, human behavior is focused on achieving physiologic homeostasis and these needs must be addressed at some level before higher needs can be addressed. For a model of resilience, the base physiological needs might be sleep, nutrition, and physical fitness. Cross-sectional studies have demonstrated that physically active individuals are less likely to develop psychological stress disorders (Martinsen, 2008). One study evaluating reactions to the stress of extreme military training of Survival, Evasion, Resistance, and Escape (SERE) noted that Service Members more aerobically fit were less likely to report distress following the training (Taylor et al., 2008).

4.2 Psychological Needs

Psychological needs that promote resilience could include optimism, hardiness, and an affiliation with military culture. Bonanno (2004) has worked with a wide variety of individuals who have suffered trauma

and loss including the death of a spouse, rape, the September 11th attack on the World Trade Center towers in New York City, and the Balkan civil war. He has identified characteristics of resilient individuals including hardiness, self-enhancing biases, positive emotion, laughter, and repression of the trauma as a coping mechanism. Similar findings have been observed by others in civilian (Butler et al, 2009; Campbell-Sills, Cohan & Stein 2006; Tugade, Fredrickson & Barrett, 2004) and military populations (King, King, Foy, Keane & Fairbank, 1999)

4.3 Knowledge & Skills

Knowledge and skills that seem essential to resilience include individual and unit training, competence in successfully completing essential tasks, and understanding of the mission. The military focuses on training core skills that can be applied to a rapidly changing and potentially dangerous environment. The ability to "adapt and overcome" adversity is highly valued. However, an overall understanding of the mission and the role an individual plays in the unit's smallest to largest elements and the application of knowledge and skills to that mission seems critical to resilience.

4.4 Social Support

Social support in the military that promotes resilience is typified by confidence and trust in leadership, unit cohesion, a team approach to mission, and cultural confidence. In behavioral health surveys conducted in the Iraq and Afghanistan theaters of operation, unit cohesion was identified as a protective factor for solider well-being (Dickstein et al., 2010; OSMNC-I, OTCS & OTSG, 2008). Confidence in leadership, especially under conditions of high combat exposure, has also been identified as playing a role in promoting resilience (OTSMNC-I & OTSG, 2009). Following deployment, lower unit support and post-deployment social support have been associated with decreased resilience and psychosocial functioning as well as increased posttraumatic stress and depressive symptoms (Pietrzak et al., 2010).

4.5 Resilience

Maslow's end-state was self-actualization (Maslow, 1943). The end-state of the currently proposed model is resilience, or positive adaptation within the context of significant adversity. Similar to Maslow's hierarchy, specific physiological, psychological, knowledge and skills, and social support needs must be addressed before resilience can be realized.

While the proposed model clearly delineates base considerations, such as sleep, often overlooked in the understanding and study of resilience, it does not appreciate either the processing or the interpretation of new experiences. Neither does this model capture the interaction between genes and the environment or the effects of these interactions on resiliency.

5.0 GAPS IN THE UNDERSTANDING OF SLEEP IN HEALTH AND RESILIENCE IN THE MILITARY

With continued military deployments around the world, psychological resiliency is emerging as an essential and key feature of a healthy force. Gaps in the understanding of military resilience, specifically as related to sleep, include assessment of both sleep and resilience and a better understanding of sleep and sleep disturbance in the military in both times of combat operation and recovery in garrison.

5.1 Assessment

5.1.1 Assessment of Sleep

Key assessments to characterize sleep include the quality of sleep, quantity (Total Sleep Time [TST]), latency (Sleep Onset Latency [SOL]), number and length of mid-sleep awakenings (Wake After Sleep Onset [WASO]), early awakenings, sleep efficiency (the number of hours of sleep as a percentage of number of hours in bed), the percent of time spent in the various sleep stages, use of medications, number and length of daytime naps, and daytime sleepiness (Morin, 1993; Pressman & Orr, 1997). See Table 1. Yet oftentimes sleep is generically assessed as "good" or "bad" by individuals, clinicians, and researchers resulting in confusion as to how best to intervene. The gold standard assessment of sleep is polysomnigraphy. Actigraphy provides another objective assessment of sleep in a more naturalistic environment. Questionnaire self-report assessments of sleep are also commonly used. However, these sleep assessments do not correlate well with each other (Buyssee et al, 2008; Lauderdale et al, 2008; Lemke, Pulh & Broderick, 1999).

In a study of 130 service members with extremity trauma sustained during service in Operation Enduring Freedom or Operation Iraqi Freedom, about three-quarters of the sample reported sleep disturbance three or more nights per week and 60% slept less than 7 hours/night as assessed by the actigraph (Young-McCaughan, Miaskowski, Bingham, Vriend, Inman & Menetrez, 2011). Yet, when the actigraph measures for those who subjectively reported sleeping well were compared to those who subjectively reported sleep disturbance, there were no significant differences from the objective measures ($p>.05$). A better understanding of how best to assess sleep and what the assessments mean in military service members is needed.

5.2 Assessment of Resilience

The Connor-Davidson Resilience Scale (CD-RISC) is one of the most widely used measures of resilience (Campbell-Sills & Stein, 2007; Connor & Davidson, 2003). It includes 10 questions asking the individual to rate themselves on the ability to adapt and deal with to change, appreciate humor, cope with stress, bounce back after hardships, achieve goals, stay focused under pressure, not be easily discouraged, and handle unpleasant feelings. The Connor-Davidson Resilience Scale does not include an assessment of sleep.

The Response to Stressful Experiences Scale (RSES; Johnson, et al., 2008), another measure of resilience, also does not include an assessment of sleep. The RSES is a 22-item questionnaire developed by a team of experts at the National Center for PTSD to assess trait-related cognitive, emotional, and behavioral resilience (Johnson, et al., 2008). It asks participants to assess how well each statement describes them, both during and after stressful events in their lives. Psychometric testing in 1,014 active duty, reserve, and veteran groups showed that the instrument has sound internal consistency as well as good test-retest reliability over 7-days. The instrument correlated positively with the Connor-Davidson Resilience Scale as well as unit cohesion, and post-deployment support. The Response to Stressful Experiences Scale correlated negatively with psychological symptom distress as assessed with the Patient Health Questionnaire - 9, posttraumatic stress as assessed with the PTSD CheckList – Military (PCL-M), and overall mental health as assessed with the Minnesota Multiphasic Personality Inventory-2 Neuroticism demonstrating concurrent validity. Factor analysis revealed a six-factor model of resilience including subscales for active coping, meaning-making, cognitive flexibility, spirituality, self-efficacy, and restoration. The Response to Stressful Experiences Scale does not include an assessment of sleep.

Revisions to the Connor-Davidson, the Response to Stressful Experiences Scale, or development of new measures should consider the assessment of sleep.

5.2 Natural History, Types & Causes of Sleep Disturbance in the Military

Seemingly not enough is known about the natural history, types, and causes of sleep disturbance in the military or how this compares with civilian populations. Sleep disturbance unique to military service includes the impact of deployment, redeployment, and physical injury on sleep. The opportunities to control the sleep environment are certainly very different in the military. The Walter Reed Army Institute of Research (WRAIR) supports a program of research focused on sleep deprivation and methods to deal with sleep debt in the support of continuous operations (Wesensten, Belenky & Balkin, 2006). Anecdotal reports from Iraq and Afghanistan suggest that continuous operations are not the primary deterrent to restful sleep, but rather being able to sleep when allowed to sleep. Seemingly, a greater emphasis needs to be placed on promoting sleep under adverse conditions.

There are myriad reasons why military members find it difficult to sleep (see Table 2). How deployment contributes to sleep disturbance beyond what is known of sleep disturbance in civilian populations or service members in garrison is not known. Neither is it known how best to intervene for specific combat-related sleep disturbances. Typical sleep hygiene interventions (such as going to bed and awaking at the same time, keeping the temperature between 60º and 70º Fahrenheit / 16º and 21º Celsius, and eliminating ambient light), sleep restriction / stimulus control behaviors (such as using bed only for sleep and getting out of bed after 30 minutes if unable to sleep) and relaxation therapies (such as guided relaxation, meditation, and yoga) are neither easily accepted in the macho military culture nor often easily used in a combat environment.

6.0 CONCLUSION

The role sleep plays in the health and resiliency of military personnel is just beginning to be recognized. Perhaps because sleep is an integral part of everyday activities and because periodic sleep disturbance is a common occurrence, the unique contribution of restful sleep to both health and wellness is not routinely considered. Military service members face unique challenges to sleep, especially during deployments. A better understanding of the types and causes of sleep disturbance in military members and the development of sleep interventions tailored to military men and women is essential in promoting resilience in the military.

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Figure 1: Model of Military Resilience

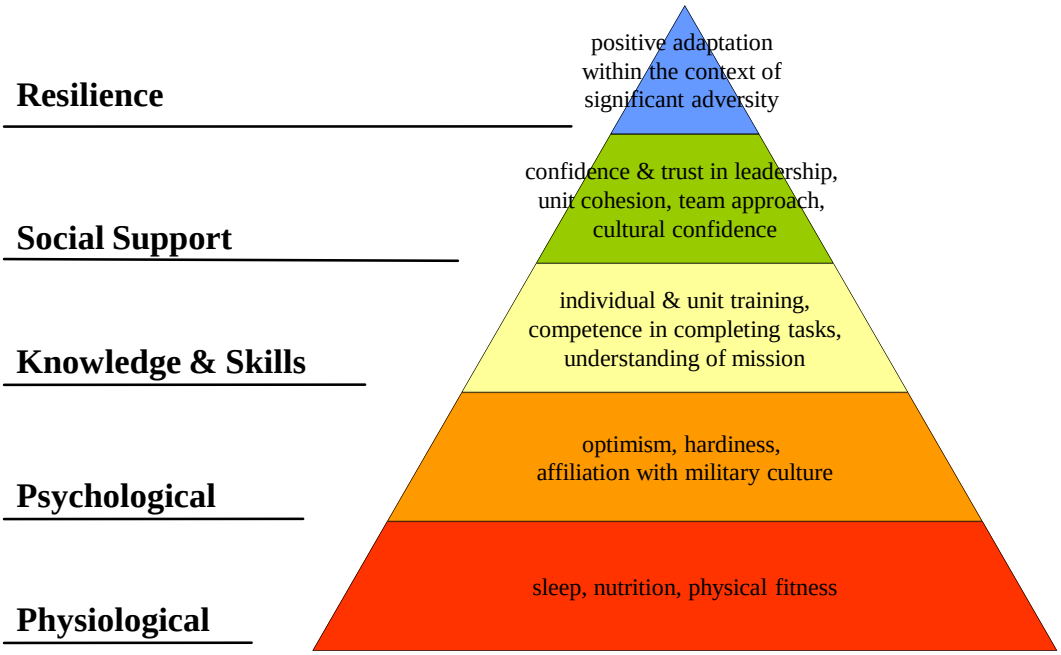

Table 1: Terms Commonly Used in the Assessment and Treatment of Insomnia

Terms & Definitions	Normal
Sleep Onset Latency (SOL) – The amount of time required to initially fall asleep after going to bed with the intention of sleeping.	In adults, SOL is normally less than 20 minutes.
Frequency of Night Awakenings (FNA) – The number of awakenings after the initial onset of sleep during the sleep period.	The FNA for a normal adult is between 2 and 6 times per night, although most people fall back asleep immediately without any awareness of having awakened.
Wake After Sleep Onset (WASO) – The duration of awake time after sleep onset including early awakening prior to getting out of bed in the morning.	In adults, WASO is normally less than 10% of the total sleep minutes or 42 minutes if the person sleeps 420 minutes (7 hours) during the night.
Time in bed (TIB) – The total amount of time spent in bed from bedtime to getting out of bed in the morning.	Normal adults spend minimal TIB while they are awake.
Total Sleep Time (TST) – The total amount of time asleep during the time in bed (TIB).	TST = TIB- (SOL + WASO) TST for an adult normally is between 7 and 9 hours (420 – 540 minutes) in 24 hours
Napping during the day – total number of minutes of sleep during the daytime. Can be intentional or unintentional sleep.	In adults, napping can normally vary from 5 minutes to 2 hours.
Excessive daytime sleepiness – episodes of lapses into sleep of short duration usually in situations in which the person is inactive for even brief periods. Excessive daytime sleepiness can result from acute or chronic sleep deprivation or loss, or other pathophysiological causes.	Adults with normal sleeping patterns do not experience excessive daytime sleepiness and have a minimal chance of dozing while engaged in routine activities.
Quality of perceived sleep – multi-dimensional perceptions of length and depth of sleep and feelings of being rested upon awakening. Subjective assessment of sufficiency of sleep for daytime functioning	Adults normally feel satisfied or very satisfied with their usual sleep pattern and feel that their sleep enhances their daily functioning.
Circadian rhythm – Biobehavioral phenomenon associated with fluctuations in light, hormones, eating, and/or socializing that repeats approximately every 24 hours.	In adults, circadian rhythm peaks and trough within a 24 hour period length.
Sleep Efficiency (SE) – the number of minutes of sleep, divided by the total number of minutes in bed, multiplied by 100 (SE = TST/TIB X 100).	In adults, a SE of 95% indicates a good night' sleep; less than 80% indicates a bad night's sleep.

Adapted from:

- Berger, A.M., Parker, K.P., Young-McCaughan, S., Mallory, G.A., Barsevick, A.M., Beck, S.L., Carpenter, J.S., Carter, P.A., Farr, L.A., Hinds, P.S., Lee, K.A., Miaskowski, C., Mock, V., Payne, J.K. and Hall, M. (2005.) Sleep/wake disturbances in people with cancer and their caregivers: State of the science. *Oncology Nursing Forum, 32*(6), E98-E126.
- Isler, W. C., Peterson, A. L.,& Isler, D. (2005). Behavioral Treatment of Insomnia in Primary Care Settings. In L. James & R. Folen (Eds.). *The Primary Care Consultant: The Next Frontier for Psychologists in Hospitals and Clinics* (pp. 121-151). Washington, D.C.: American Psychological Association.

Table 2: Causes of Sleep Disturbance Unique to Military Deployment

- Adverse sleeping environments of limited and uncomfortable space, excessive noise (for example from generators, aircraft operations, or explosions), temperature extremes, ambient light, and noxious fumes and smells.
- Continuous high sensory input from televisions, computers, phones, video games, and other electronic devices.
- Realistic or perceived threat to life or of injury
- The need for instant alertness to respond to an attack or when called to duty.
- Excessive and ill-timed use of caffeine, tobacco and alcohol that can disrupt sleep.
- The concurrent use of multiple medications to control symptoms of stress and/or to promote sleep which, counter-intuitively, lead to more disturbed sleep.