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GOOD NIGHT—SLEEP AND FIRST RESPONDERS

BACKGROUND

Sleep is an important component in facilitating recovery from exercise, and has recently become a focus within sport science to optimize athlete performance (45,46). Recovery can be defined as the return to homeostasis of various physiological systems following the metabolic, thermoregulatory, and inflammatory challenges incurred by exercise (21). Recovery is intended to negate the fatigue or damage incurred during training or competition, such that the individual can meet or exceed performance in a particular activity (6). Effective recovery is essential to ensure individuals can perform to the best of their ability within physically demanding tasks (whether during training or on the job). Sleep can help facilitate the process of recovering from physically demanding tasks.

Over the last 50 years, studies on sleep have been performed in various fields, such as military, medical services, transportation, and industry (5). Research in military settings have application to first responders and suggest that inadequate sleep is associated with risk of injury, increased physiological stress, and poor academic performance. For instance, Ritland et al. found the transition from daytime to nighttime activities in Army Rangers has been shown to have a negative effect on dynamic balance as measured by the Y-balance test (36). Ritland et al. estimated that one in every two Army Rangers were potentially at a higher risk for injury during this period (36). In a study conducted on 7,576 soldiers in the United States Army Special Operations Command, Grier et al. found that soldiers who self-reported a sleep duration of eight hours or more per night also self-reported less injuries than soldiers who had fewer hours of sleep (19). Sixty hours of sleep deprivation in military cadets led to decreased oxygen consumption, ventilation, and heart rate in a submaximal bicycle ergometer test (42). During basic combat training, Crowley et al. detailed that soldiers self-reported reduced sleep quality and duration, due to several reasons (e.g., drill sergeants entering to wake soldiers, uncomfortable temperature, performing fireguard duty during the night, being awoken when other soldiers started or ended fireguard duty) (14). Crowley et al. also described how several soldiers felt that their academic and physical training performance suffered because of a lack of sleep (14). Collectively, these studies highlight some issues that are also recognizable for first responders.

Poor sleep quality has long been recognized as an issue for police officers and firefighters. Following a meta-analysis of the research literature, Garbarino et al. described that percentages of police officers who reported poor sleep quality was between 23 – 79% (18). However, Garbarino et al. reported that the pooled prevalence of police officers recorded as having poor sleep quality was 51.1% (18). This percentage was similar to data reported by Carey et al. on firefighters (9). Carey et al. investigated the relationship between sleep quality and firefighters, and identified 59% of firefighters to be sleep deprived within a major United States metropolitan city (9). Firefighters in Finland who worked more than 50 hours a week also conveyed sleep disturbances (28). In an analysis of South Korean firefighters, 38.5% of non-shiftwork firefighters and 51.6% of shiftwork firefighters experienced poor sleep quality (27).

Shift work in first responders can result in interrupted sleep schedules. For example, the Kelly schedule (24 hours on/24 hours off/24 hours on/24 hours off/24 hours on/96 hours off) can result in a five-day period where the firefighter has circadian dysrhythmia (i.e., disruption of the normal wakefulness and sleep cycles) (5). In addition to shift schedule, numerous other factors inherent to a first responder's career can negatively impact sleep quantity and quality. Some examples include stress, interrupted sleep due to emergency responses, and family obligations outside of work (11,16). This can be problematic; for example, poor or restricted sleep has been linked to conservation of effort in job task performance, reduced cognitive functioning, and increased risk of injury in firefighters (23,38,44). Bonnet and Arand also noted that harmful acute effects from sleep deprivation can include mood changes, slower reaction times, reduced vigilance, and short-term memory loss (8). Chronic effects of sleep disruptions entail negative consequences to gastrointestinal, immune, endocrine, and cardiovascular functions, and can influence obesity (1,26,29,30). This is particularly pertinent for first responders, given their increased risk of cardiovascular disease (37,47).

It is typical for first responders to not be "working" the entire time they are completing a work shift. For example, firefighters may have opportunities to sleep/nap when on duty, as long as they wake up and respond to emergency calls when required (20). The conditions and volume of emergency calls received by a police or fire department can vary. For example, specific to fire stations, emergency calls are dependent on the location of the station (e.g., certain fire stations within the same city may receive more calls than others), services provided (e.g., basic life support, advanced life support, first responder), the amount and types of firefighters available on a work shift (e.g., firefighter/paramedics, firefighter), and time of day (e.g., day versus night) (13,20). Peak demand is from 2:00 pm to 6:00 pm (33). Only 4% of runs for firefighters are actually fire-related, while the majority of calls require emergency medical services (33). Nonetheless, it can be challenging to rely on generalizations from other occupations regarding sleep quality, sleep deprivation, and sleep interruptions, to truly understand a first responder's experience. It is incumbent on the tactical facilitator to effectively communicate directly with the personnel they are working with and consider methods to obtain objective and subjective measures of sleep.

SLEEP TRACKING

Sleep quality is how well an individual rested in their previous session of sleep and can be determined via objective and subjective methods (5,9,20). Quality of sleep can be objectively measured by analyzing sleep duration (i.e., how long did an individual sleep), sleep efficiency (i.e., the percentage of time spent asleep while in bed), sleep latency/sleep onset latency (i.e., the amount of time it takes to fall asleep), and wake after sleep onset (i.e., the amount of time spent awake after initially falling asleep) (9). There has been a proliferation of wearable technology than can be used to monitor sleep (specifically hours and quality), with varying degrees of accuracy (3,15). Some of the more accessible examples include rings, activity trackers worn on the wrist, and smartphone applications (2,3). As an example, a wearable ring device purports to detect pulse rate, variation in interbeat intervals (i.e., a measure of heart rate variability), and pulse amplitude (31). Manufacturers of wearable ring devices state that these physiological data can be used within their equipment to produce numerous physiological variables (31). Specific to sleep, this includes resting heart rate, respiration rate, and time spent in the different sleep cycles (e.g., light, deep, and rapid eye movement [REM] sleep) to determine sleep quality (31). However, it can cost several hundred dollars to purchase an individual ring, with an on-going software subscription adding to the cost. Organizations will need to consider what financial outlay they would be comfortable with if there was any department-wide drive to monitor sleep in their personnel. Moreover, a consideration for the tactical facilitator is that union approval would be required to collect data such as this from their personnel. The tactical facilitator will need to consider whether it is worth attempting to pursue this within their organization.

Sleep diaries and questionnaires can also be used to subjectively document the hours and quality of sleep of the individual. Commonly utilized questionnaires in sleep research that can illustrate sleep deprivation include the Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS) (5,9,20). The PSQI can establish disturbed sleeping patterns, while the ESS monitors daytime alertness. The use of subjective measures could either supplement objective measurements or be used as a means to reduce the cost associated with sleep tracking for the tactical facilitator (12,22). App-based software could also be a means for the tactical facilitator to reduce the burden on personnel for reporting sleep quality, as alerts and responses can be driven by an app (22,24). Even so, the tactical facilitator should be cognizant of how data will be stored and who has access to this information. Open discussions with personnel and union representatives will be required, even if intentions are altruistic for the first responders.

Nonetheless, the tactical facilitator should recognize that it is not as simple as telling a first responder that they should get more sleep, because in many instances that may not be possible. Anecdotally, it would appear to be intuitive that people would be aware if they have had a bad night of sleep, so the provision of reporting such information may be considered redundant. However, in an analysis of healthcare workers from a pediatric intensive care unit, Puerta et al. suggested the workers were not aware of their bad sleep quality, even though the majority of those surveyed would be considered to regularly experience poor sleep (12/15 [80%] of doctors, 38/50 [76%] of nurses, and 19/20 [95%] of nurse assistants) (35). Indeed, just under half the doctors (7/15), half the nurses, and 18/20 nurse assistants perceived that they had bad sleep quality. If nothing else, sleep tracking, whether via wearable technology, diaries, or questionnaires, could be used as an educational tool to reinforce good habits (i.e., what behaviors were performed prior to a good night of sleep).

PRACTICAL RECOMMENDATIONS

Some examples and actionable recommendations for encouraging better sleep have been provided by the Centers for Disease Control and Prevention and the American Academy of Sleep Medicine, and are shown in Table 1 (4,10). The American Academy of Sleep Medicine recommends 7 – 8 hr of sleep per night (4). While this may be possible for those who experience one sleep episode per night in the same sleeping environment, the work characteristics of first responders often do not allow for traditional sleep cycles. Previous research on police officers has shown an average sleep duration of six hours per night (11). Any recommendations relative to sleep for first responders should be made within the context of the individual's personal situation. It is critical to recognize that no single sleep strategy will address the needs of every first responder and developing an individualized and flexible strategy is imperative. Realistically, many first responders experience fragmented sleep or multiple sleep episodes per night, especially when on shift. Where possible, naps could reduce any physical performance impairments, which may be beneficial in situations where the first responder has experienced circadian dysrhythmia (25). Cognitive performance can also be enhanced following a nap (17,40). Shorter naps can also aid in avoiding sleep inertia, which is the transitional state from being asleep to being awake (40,41). General recommendations for napping tend to suggest keeping naps relatively short (i.e., 10 – 30 min) (32,34,39). Other practical guidelines for taking naps that could be useful for first responders are shown in Table 2.

It is important to remember that naps, though common, are not a permanent replacement to the benefits of a full night's rest, but rather a countermeasure that is not only time efficient but could potentially provide short-term benefits when used in addition to other healthy sleep habits. As shown in Table 1, there are some relatively simple habits that can be implemented by the first responder to at least create an environment where better sleep could occur. For example, establishing some form of routine; limiting large meals, caffeine, and alcohol in the time prior to the individual's preferred bedtime; and turning off electronic devices

30 min before bed are attainable strategies. Blackout curtains could also be an option for first responders, especially those that may have to sleep during the day (7).

The tactical facilitator could use sleep trackers, diaries, or questionnaires as part of their approach. Furthermore, this information should not be used for punitive purposes, such as pulling someone off the line if they sleep poorly, which may lead to significant legal challenges and reduce trust among first responders regarding how the information collected will be used. Nonetheless, the provision of resources to first responder personnel could also be beneficial, whether it is information about sleep hygiene or access to medical services for more serious issues (4,10,43). Increased awareness and understanding of sleep in relation to the health and wellbeing of first responders should not only be viewed from an occupational standpoint, but within the perspective of public health in order to guarantee safety (15). The tactical facilitator can play a very positive role in educating the first responder about how to optimize sleep specific to their situation.

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TABLE 1. PRACTICAL RECOMMENDATIONS FOR ESTABLISHING GOOD SLEEP HABITS FOR FIRST RESPONDERS

RECOMMENDATIONS
Where possible, keep a consistent sleep schedule and establish a consistent bedtime routine.
Avoid going to bed unless sleepy.
Make sure bedroom is quiet, dark, relaxing, and at a comfortable temperature.
Establish a relaxing bedtime routine.
Limit exposure to bright lights in the evenings whenever possible.
Ideally, turn off electronic devices at least 30 min before bedtime. At the very least, adjust settings in electronic devices to reduce screen brightness (dark mode) and use sleep mode/bed mode settings where possible.
Avoid large meals, caffeine, and alcohol before bedtime.
Use your bed only for sleep.
Exercise regularly and maintain a healthy diet.
Reduce fluid intake before bedtime.
If you do not fall asleep after about 20 min, get out of bed and do a quiet activity without a lot of light exposure (avoid electronics).

Information has been adapted from the American Academy of Sleep Medicine (4) and the Centers for Disease Control and Prevention (10)

TABLE 2. PRACTICAL RECOMMENDATIONS FOR NAP TAKING FOR FIRST RESPONDERS

RECOMMENDATIONS
Keep naps short (between 10 – 30 min have been recommended).
Set an alarm. This will make sure the first responder can nap for the preferred time period.
If possible, take naps in the early afternoon. Naps after 3:00 pm may interfere with normal sleep cycle (if the first responder has a normal sleep cycle).
Create a restful environment for a nap (quiet, dark place with few distractions).
Eye masks and ear plugs may be useful to create an environment with fewer distractions.
Consuming caffeine immediately before taking a nap could allow for a boost of energy upon waking, as it may take the individual about 30 min to feel the effects of caffeine.

Information has been adapted from the Mayo Clinic (32), National Institute for Occupational Safety and Health (34), and Summer and Singh (39)

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