



A fatigued trainee rests during a break at the Buddy Movement Course, Fort Jackson, South Carolina, 9 August 2006. (Photo by Staff Sgt. Stacy L. Pearsall, U.S. Air Force)

# Sleep Banking

## Improving Fighter Management

Maj. Amy Thompson, U.S. Army

Capt. Brad Jones, U.S. Army

Capt. Jordan Thornburg, U.S. Army

**T**he 1st Armored Brigade Combat Team, 1st Infantry Division, was selected in 2015 to participate in the “Performance Triad” pilot program led by the Office of the Surgeon General (OTSG).<sup>1</sup> The Performance Triad program focuses on our basic biological health needs—sleep, activity,

and nutrition—all of which are important for survival, health, performance, safety, and readiness.<sup>2</sup> The goal of the program is to improve the health of the force and optimize human performance. Health is the foundation of readiness, and readiness is the Army’s number one priority.<sup>3</sup> The focus of this article is sleep.



In December 2015, the brigade surgeon was invited to attend the Army Sleep Summit at the OTSG headquarters. A diverse working group of military leaders and top researchers in the field of sleep science attended the summit to discuss the impact of sleep on performance, health, safety, and readiness. Many experts made a compelling case throughout the sleep summit that sleep duration, daytime impairment, and fatigue are significant correlates of diminished cognitive performance, poor physical health, depression, suicide ideation, motor vehicle accidents, and occupational injury. Specifically, leaders discussed *sleep banking* throughout the summit as a way to optimize sleep and enhance performance. Significant findings from research show that sleep can be “banked” in advance of periods of sleep restriction to improve alertness and performance, and that it contributes to faster recovery from fatigue-induced impairments.<sup>4</sup> Sleep banking can be planned, operationalized, and strategically placed before a known period of sleep restriction to create large gains in performance when the stakes are high. Sleep banking before performance could be the difference between winning and losing—or life and death.

Soldiers of Bulldog Troop, 1st Squadron, 40th Cavalry Regiment recover in a hasty fighting position 4 September 2009 after a night patrol in the mountains near Sar Howza, Paktika Province, Afghanistan. (Photo by Staff Sgt. Andrew Smith, U.S. Army)

## The Fatigue of the Force

Sleep benefits the brain. Conversely, sleep loss is characterized by brain deactivation, especially in the brain regions that mediate cognitive performance and alertness. Performance deficits often result from the effects of sleep loss combined with circadian rhythm misalignment.<sup>5</sup> The short-term consequences of sleep loss are attention deficit, slowed reaction time, reduced alertness, impaired problem solving, and reduced motivation.<sup>6</sup>

A 2015 RAND Corporation study reported that 72 percent of service members get less than seven hours of sleep per night, and 23 percent receive less than six.<sup>7</sup> Routinely getting five to six hours per night of sleep is like performing with a blood alcohol level of 0.08 percent.<sup>8</sup> Less than seven hours of sleep for three or more days correlates to a 20 percent decrease in cognitive performance.<sup>9</sup> In 2014, fatigue was a contributing factor in

628 Army accidents and 32 deaths.<sup>10</sup> Sleep loss results in deficits that affect performance effectiveness and safety in operational and nonoperational environments.

Sleep is a biological need, and it is critically important for soldier health. The lack of sleep and increasing number of sleep disorders among service members is a major public health concern. In 2014, up to 14 percent of soldiers across the Army were diagnosed with a sleep disorder.<sup>11</sup> Those lacking sufficient sleep are more likely to suffer from chronic diseases such as hypertension, diabetes, depression, obesity, and cancer; they tend to have a higher mortality rate, a lower quality of life, and less overall productivity.<sup>12</sup> Sleep—or the lack thereof—amounts to being a health, safety, and readiness issue. With readiness at stake, we can no longer ignore the fatigue of the force or allow cultural barriers to continue to inhibit improvement of this larger public health issue. In Army organizations, losing is not an option; the cost of poor performance is high, so mitigating the risks associated with sleep loss and fatigue is imperative.

## Cultural Barriers

Military culture historically does not place a priority on sleep. This is evident in a well-known Army recruiting slogan: “We get more done by nine o’clock than most people do all day.” We know that optimal sleep is critical to mission success. Soldiers and leaders associate poor sleep with impaired reaction time, poor judgment, accidents, and low morale. However, despite mission degradation, a cultural acceptance of suboptimal sleep and a perception that lack of sleep is the “Army way” prevail in the force.<sup>13</sup>

The idea of allowing soldiers to optimize sleep, report to work at 0900, and conduct physical training in the afternoon for a seven- to ten-day period before a training event would be quickly dismissed in many circles in the Army. Yet, high-performing teams are willing to change their cultures if a behavior is no longer productive. Having a supportive command climate in the brigade, one that was open to change, was vital to creating an opportunity for performance enhancement and conducting the sleep banking assessment. Once the command team was briefed on the science behind sleep banking, to include discussion of other

**Maj. Amy Thompson,**  
U.S. Army, is the brigade surgeon for the 1st Armored Brigade Combat Team, 1st Infantry Division.

studies on sleep and performance such as the Harvard Hospital study, the Stanford men’s basketball team sleep extension study, the high schools delayed-start study, and the Harvard Police study, the brigade commander directed one of his subordinate units to support the trial.<sup>14</sup> Then, after gaining “buy in” from the highest level of leadership, the subordinate commanders pushed the initiative to the company and platoon levels.

## Operationalizing Sleep Banking

Knowledge of the Performance Triad, the brigade’s engagement in the Army Sleep Summit, and a brigade command climate that empowered innovation combined to create momentum toward a sleep-banking initiative. Encouraged by the brigade command team, subordinate-unit leadership deliberately focused on fighter-management improvement by operationalizing sleep banking before gunnery in an infantry unit.

As a trial, 2nd Platoon, Company C (Charlie Company), 3rd Battalion, 66th Armored Regiment, was chosen to conduct sleep banking before a February 2016 field training exercise (FTX), during which the unit would fire Gunnery Table (GT) VI.<sup>15</sup> During this FTX, soldiers would conduct twenty-four-hour operations, sleeping when possible—many times in a Bradley Fighting Vehicle (BFV)—and typically would average three to five hours of sleep daily for seven days, depending on leadership roles. The trial would compare GT VI scores from an October 2015 FTX to scores from the February 2016 FTX to determine if sleep banking affected gunnery performance. Additionally, evaluators would receive subjective feedback from the soldiers during the sleep-bank week and during the sleep-restricted period to discover further the effects of sleep banking on performance, health, and wellness. The company commander scheduled time for the brigade medical team to educate the platoon on the science behind sleep and the potential benefits of sleep banking before the FTX.

**Capt. Brad Jones,**  
U.S. Army, is the commander of Company C, 3rd Battalion, 66th Armored Regiment, 1st Armored Brigade Combat Team, 1st Infantry Division.

**Capt. Jordan Thornburg,**  
U.S. Army, is the physician assistant for 3rd Battalion, 66th Armored Regiment, 1st Armored Brigade Combat Team, 1st Infantry Division.

In order to allow the platoon to sleep bank effectively, an adjustment to the normal Army duty schedule was required. The platoon normally shows up for work at 0600 before starting 0630 physical training (PT). From 5–14 February 2016, the command agreed to “reverse PT,” where the soldiers would show up at 0900 and conduct PT in the afternoon at 1600. This adjustment fell more in line with the natural circadian

controlled, including personnel changes, soldier experience levels, crew dynamics, weather, range execution, and maintenance issues. Additionally, the unit had four months of increased training before the latter FTX.

In October 2015, two of the four crews in 2nd Platoon qualified on their first attempt, while two required multiple attempts to meet the minimum qualification requirements (700 of 1,000 points and



rhythm of sleep, which is from approximately from 2300 to 0700 (the best hours of sleep are early in the morning when the soldiers are normally getting ready for work).<sup>16</sup> During this sleep-banking time, the soldiers were required to keep a “sleep journal” in which they logged their hours of sleep. Sleep journals showed that for the ten-day period before the FTX, the platoon averaged 8.9 hours of sleep per night, significantly more than the reported average of five to six hours per night before sleep banking.

### **Gunnery Performance Improvement**

The GT VI (crew-level gunnery) scores for 2nd Platoon increased substantially from the October 2015 (no sleep banking) FTX to the February 2016 (sleep banking) FTX. However, many factors were not

7 of 10 passed engagements). Upon completion of the FTX, the overall platoon average score was 756 out of a possible 1,000.

In February 2016, following a weeklong period of sleep banking, all four crews in 2nd Platoon qualified on their first attempt, and the platoon average score increased by 163 points up to 919 out of 1,000 points. In addition to the improved scores, the platoon executed GT VI without safety violations, accidents, or injuries.

### **Soldier and Leader Feedback and Impact on Health**

Upon completion of GT VI, all members of the platoon were questioned on how sleep banking affected their health and performance during gunnery. Subjective feedback from across the platoon was

overwhelmingly positive. For example, feedback from soldiers at all levels up to the battalion commander indicated that 2nd Platoon had noticeably higher levels of morale and motivation than any other unit throughout their week of sleep banking and their week in the field at gunnery.

Soldiers stated they got more sleep overall, which positively affected their mood, morale, and motivation.

down their morning pace, which positively affected their children's stress level as well. Soldiers and leaders described increased efficiency and productivity beginning early in the morning and lasting throughout the workday. According to leaders, the platoon appeared happier and had higher morale overall.

During the week in the field, soldiers and leaders reported going into the mission feeling well and not



They preferred doing PT in the afternoons, reporting more productive workouts with greater gains due to being more awake, being more motivated, having more energy (potentially also related to snacking throughout the day), and sleeping better at night. Soldiers reported that doing PT in the afternoon made their entire day more efficient with less time wasted overall. Conversely, leadership reported having a harder time doing PT in the afternoon because many of their meetings were scheduled later in the day based on traditional battle-rhythm events.

Soldiers and leaders alike reported improved family time in the mornings, less stress, and less irritability, and many reported eating a better breakfast. Soldiers who were single parents also reported less stress, and they were appreciative that they were able to slow

Chief Mass Communication Spc. Keith DeVinney, U.S. Navy, sleeps between exercises during Fleet Combat Camera Pacific's Winter Quick Shot 2013 combined field training exercise, held 17 February 2013 in the Angeles National Forest near Azusa, California. (Photo by Mass Communication Specialist 1st Class Peter D. Blair, U.S. Navy)

fatigued. They felt more receptive to new information and feedback, and they were able to grasp new information more quickly. They noted being more engaged, and they said they were better able to tackle tasks more quickly and efficiently. The leadership reported that higher morale continued throughout gunnery. No accidents or injuries were reported. For 2nd Platoon, sleep banking appears to have resulted in improved health, wellness, performance, and quality of life both at home and at work.

## The Way Forward with Fighter Management

Charlie Company continued to demonstrate how sleep banking results in improving fighter management. After completion of GT VI and the stellar performance by 2nd Platoon, the company commander strategically implemented sleep banking 5–13 March 2016 for the entire company, the week prior to executing GT XII. The move proved fruitful; all three platoons in Charlie Company qualified on GT XII with an average score of 79 percent. For reference, the Army considers 50 percent the minimum for advancement to company-level collective training.

Once again, the feedback from soldiers and leaders indicated overwhelmingly positive impacts across all aspects of performance, health, safety, and quality of life. The commander reported that sleep banking contributed to increased morale and improved mental health of all soldiers. He noticed increased motivation during afternoon PT and while performing mundane tasks, and he concluded that sleep banking led to an overall better quality of life for his soldiers.

### Conclusion

Sleep banking for seven to ten days prior to a known period of sleep restriction has a positive impact on performance and health. Reverse PT allows soldiers to optimize sleep and gain two or three more hours because it aligns with the natural circadian rhythm. Commanders and leaders are responsible for implementing deliberate sleep-management strategies and ensuring they are included in mission planning when periods of sleep restriction are anticipated. The benefits are already proven by sleep science and research across



Lt. Col. Ingrid Lim, Office of the Surgeon General Performance Triad staff member, gathers feedback on fatigue, sleep, and performance from the commander and first sergeant of Headquarters and Headquarters Company, 3rd Battalion, 66th Armor Regiment, Capt. Remington Adams and 1st Sgt. Willie Watson, 15 March 2016 during Table XII gunnery at Fort Riley, Kansas. (Photo by Maj. Amy Thompson, U.S. Army)

other organizations and cannot be overlooked. The Performance Triad has taught us that a commander's emphasis on sleep must equal emphasis on physical fitness if we expect optimal performance.<sup>17</sup> The Army should continue to improve fighter management by operationalizing sleep. Sleep banking improves the health and safety of soldiers and enhances unit readiness. ■

## Notes

1. Tim Hrenchir, "Army 'Triad' Pilot Program Encourages Soldiers to Take Better Care of Themselves," *Topeka Capital-Journal* online, 20 December 2015, accessed 30 September 2016, <http://cjonline.com/news/2015-12-20/army-triad-pilot-program-encourages-soldiers-take-better-care-themselves#>.
2. Army Medical Department, *Performance Triad: A Leader's Guide and Planner*, Army Medicine website, accessed 30 September 2016, [http://armymedicine.mil/Documents/Leaders-Guide\\_Planner\\_08\\_07\\_2013.pdf](http://armymedicine.mil/Documents/Leaders-Guide_Planner_08_07_2013.pdf).
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8. Office of the Surgeon General (OTSG), *Health of the Force*, Army Public Health Center (Provisional) Health of the Force Report, November 2015, 11, accessed 30 September 2016, <https://www.army.mil/e2/c/downloads/419337.pdf>.
9. *Ibid.*, 5.
10. *Ibid.*
11. *Ibid.*, 2.
12. Centers for Disease Control and Prevention (CDC), "Sleep and Sleep Disorders," CDC website, accessed 30 September 2016, <http://www.cdc.gov/Sleep/index.html>.
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14. Christopher P. Landrigan et al., "Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units," *New England Journal of Medicine* 351 (2004): 1838–48; Cheri D. Mah et al., "The Effects of Sleep Extension on the Athletic Performance of Collegiate Basketball Players," *Sleep* 34, no. 7 (2011): 943–50; Judith A. Owens, Katherine Belon, and Patricia Moss, "Impact of Delaying School Start Time on Adolescent Sleep, Mood, and Behavior," *Archives of Pediatric and Adolescent Medicine* 164, no. 7 (2010): 608–14; Shantha M. W. Rajaratnam et al., "Sleep Disorders, Health, Safety in Police Officers," *Journal of American Medical Association* 306, no. 23 (2011): 2567–78.
15. Bradley Fighting Vehicle (BFV) gunnery tables range from table I (crew critical skills) to table XII (platoon qualification). Gunnery table VI is crew qualification, executed by individual BFV crews (in subsequent tables, BFVs operate in teams). Table VI entails engaging moving and stationary targets with all weapon systems (main gun and machine guns) while stationary and moving.
16. Owens, Belon, and Moss, "Impact of Delaying School Start Time."
17. Robert Abrams, U.S. Army Forces Command (FORSCOM) Command Training Guidance, 19 October 2015, cited in OTSG, *Health of the Force*, 6.



Soldiers from Headquarters and Headquarters Battalion, 4th Infantry Division, led by their commander, Lt. Col. Brad Wambeke, participate in a four-mile installation run 4 June 2012 on Fort Carson, Colorado. (Photo by Staff Sgt. Andrew Porch, U.S. Army)

## Sleep Emphasis on Fort Carson

A sleep experiment similar to 1st Infantry Division's drew praise from Army health officials, according to a story in the *Denver Post*.<sup>1</sup> In 2014, Fort Carson's leadership changed the standard duty day to allow soldiers to come into work later and conduct physical fitness training at the end of the day instead of first thing in the morning, as is the norm across the Army.

Col. Deydre Teyhen, the Army's assistant deputy chief of staff for public health, cited the Fort Carson program in an interview with Federal News Radio: "Our best example probably is at Fort Carson, where they started reverse-cycle physical training. They do PT at the end of the day instead of in the morning. Not only do they get more sleep, it allowed soldiers to help get the kids ready for school and spend some time with the family before everybody went out the door. It's been a huge success, not only for the families but for the soldiers, because we know that being sleep deprived by four hours decreases your maximum bench press by twenty pounds. If we want to get the most out of unit PT, doing that at a time when they're not sleep deprived is the way to do it. We're seeing pockets of success and I think it's going to continue to grow."<sup>2</sup>

Unfortunately, the program was curtailed due to "epic traffic jams" caused by "about twenty thousand soldiers" conducting physical training on Fort Carson's roads during high-traffic periods for civilian employees.<sup>3</sup>

## Notes

1. "Study Credits Fort Carson for Letting Soldiers Sleep In," *Denver Post*, updated 9 June 2016, accessed 9 November 2016, <http://www.denverpost.com/2016/03/20/study-credits-fort-carson-for-letting-soldiers-sleep-in/>.
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3. "Study Credits Fort Carson."