



Clinical Digest

ONLINE EDITION

SLEEP DEPRIVATION

The Effects of Sleep Deprivation on the Performance of Surgery

Surgical performance may take more concentration, but modest sleep deprivation need not get in the way of performing surgical tasks—and even learning new tasks, say researchers from the Penn State Hershey Medical Center and the Penn State College of Medicine.

By “modest sleep deprivation,” the researchers mean having had only 2 hours of sleep in a 24-hour period—or as residents may know it, the reality of the 24-hour call shift. To find out the effects of fatigue on technical and cognitive functions, the researchers randomly assigned 31 students to a sleep-deprived group or a control group. Baseline testing was performed on day 1, then repeated on day 2. On day 2, the researchers gave the participants a novel task to perform and assessed fatigue, using the Epworth Sleepiness Scale (ESS), and cognitive capabilities, using the National Aeronautics and Space Administration-Task Load Index (NASA-TLX).

The RapidFire simulator was used

to test the subjects on the performance of learned, repetitive tasks, with levels designed to teach hand-eye coordination and motor skills related to laparoscopic surgery. The score is based on the number of targets acquired, efficiency of movement, and errors such as past pointing and tool collision. The EndoTower simulator was used to train participants to manipulate a 30°, angled laparoscopic lens in a simulated 3-dimensional space. The score is calculated based on time to complete the task, number of errors, and time spent with the camera off-axis. Finally, the NASA-TLX was used to assess a task's difficulty based on mental demand, physical demand, and other factors.

The researchers anticipated that sleep deprivation would impair laparoscopic performance, increase mental workload, and make it harder to learn the new skill. Surprisingly, however, the participants were able to perform satisfactorily, although they did, indeed, show increased cognitive workload.

In this study, both groups were still able to perform a primary and secondary task adequately on day 2. In another test the participants were asked to count a flashing yellow disk in the

corner of a computer screen. On day 1, the control group had a mean of 2.07 errors, and on day 2, a mean of 3.56 errors. The sleep-deprived group had a mean of 4.6 errors on day 1 and 4.53 errors on day 2. The change in mean errors was 1.4. The sleep-deprived students were able to count the disk appropriately and still perform the laparoscopic task with an overall improvement in score.

The sleep deprivation began to show when participants were required to estimate time. They couldn't, for instance, gauge how much time it would take to complete a task. The ability to estimate time is important, the researchers point out, not only in work-related tasks, but also in daily activities, such as driving a car or walking across a busy road.

A real danger arises when unexpected events put more stress on human mental capacity. As workload increases, there's less capacity left to perform secondary skills, which means more chance of error. All the tasks in this study were simulated. More research is needed to find out how much impact the higher workload has on caring for real patients. ●

Source: Tomasko JM, Pauli EM, Kunselman AR, Haluck RS. *Am J Surg*. 2012;203(1):37-43. doi:10.1016/j.amjsurg.2011.08.009.