Sleep Disruption and Memory

A deficit in the ability to form new human memories without sleep.
Yoo, Seung-Schik, et al.
Nature Neuroscience, Vol 10(3), Mar, 2007. pp. 385-392.
Abstract:

Evidence indicates that sleep after learning is critical for the subsequent consolidation of human memory. Whether sleep before learning is equally essential for the initial formation of new memories, however, remains an open question. We report that a single night of sleep deprivation produces a significant deficit in hippocampal activity during episodic memory encoding, resulting in worse subsequent retention. Furthermore, these hippocampal impairments instantiate a different pattern of functional connectivity in basic alertness networks of the brainstem and thalamus. We also find that unique prefrontal regions predict the success of encoding for sleep-deprived individuals relative to those who have slept normally. These results demonstrate that an absence of prior sleep substantially compromises the neural and behavioral capacity for committing new experiences to memory. It therefore appears that sleep before learning is critical in preparing the human brain for next-day memory formation--a worrying finding considering society's increasing erosion of sleep time.

". . . an absence of prior sleep substantially compromises the neural and behavioral capacity for committing new experiences to memory. It therefore appears that sleep before learning is critical in preparing the human brain for next-day memory formation."

Yoo (2007), p. 385

"Taken together, our results suggest a marked deficit in the neural ability to encode new human memories under conditions of sleep deprivation. Common across all comparisons were impairments within the hippocampal complex - a region known to be critical for learning new episodic information. It therefore seems that not only is sleep essential after learning for the subsequent consolidation of memory, but sleep before learning is equally important in preparing the brain for next-day memory formation."

Yoo (2007), p. 389

Sleep benefits subsequent hippocampal functioning.
Van Der Werf, Ysbrand D., et al.
Nature Neuroscience, Vol 12(2), Feb, 2009. pp. 122-123.
Abstract:

Sleep before learning benefits memory encoding through unknown mechanisms. We found that even a mild sleep disruption that suppressed slow-wave activity and induced shallow sleep, but did not reduce total sleep time, was sufficient to affect subsequent successful encoding-related hippocampal activation and memory performance in healthy human subjects. Implicit learning was not affected. Our results suggest that the hippocampus is particularly sensitive to shallow, but intact, sleep.

"Our data suggest that deep sleep before learning allows for optimal hippocampal activity and benefits memory encoding." Van Der Werf (2009), p. 123