

The Effect of a Brief Daytime Nap on the Consolidation of Declarative Memory

Abstract

Evidence suggests that the consolidation of human declarative memory, beyond the storage of detailed memory, likely involves a generalizing mechanism that maintains the general theme, or gist, of the memory. A number of studies have shown that sleep, specifically slow wave sleep, improves declarative memory, but the relative benefits of sleep on detailed and gist memory have yet to be researched. Using the Deese-Roediger-McDermott memory task that allows evaluation of both detailed and gist memory, we conducted a three-part project to evaluate the effect of a night of sleep and a daytime nap on the consolidation of declarative memory. In Experiment 1, we found that a full night of sleep promotes enhanced gist memory and significantly better veridical recall. In Experiments 2 and 3, we employed a daytime nap paradigm with polysomnography that allowed physiological analysis while eliminating interference and circadian confounds. In Experiment 2, we did not find any effects of a daytime nap on memory, which we attributed to the temporal delay between learning and sleep. In Experiment 3, we found that subjects who took a brief daytime nap shortly after learning exhibited significantly higher gist memory. In addition, the amount of slow wave sleep obtained correlated negatively with veridical recall, demonstrating a novel correlation between sleep stages and memory that expands our understanding of the effect of sleep on declarative memory consolidation. We propose a mechanism for this relationship by which sleep, specifically slow wave sleep, may reorganize new, semantically-charged information in accordance with the pre-existing semantic memory system. The results from the three experiments provide compelling evidence that sleep may reorganize and condense new information to produce a more useful representation of declarative memory that is thematically coherent with the brain's existing knowledge base.