

RESIDUAL COGNITIVE PROCESSING IN ALTERED STATES OF CONSCIOUSNESS

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Today's technological and methodological advances allow the characterization of sleep at a level beyond the scope of just some years ago. PET and fMRI data have consistently demonstrated that global and regional patterns of brain activity during sleep are remarkably different from wakefulness. However, some discrepancies especially with respect to a postulated "quiescent brain" during deep non-REM sleep still remain. As will be outlined, some of these inconsistent findings are probably related to the fact that earlier studies did not have sufficient time resolution in order to identify transient brain activations such as those associated with sleep spindles or the up-phase of the slow oscillation.

Next I will turn to interesting evidence for the persistence of brain activity in response to external stimuli even during states of obvious "unconsciousness" such as sleep. Thereafter, I will focus on studies suggesting a close interplay of plastic brain changes occurring during sleep after previous learning and its influence on subsequent behavior. Latter is considered my main research area, and I will argue that is highly needed to take a much closer look to the specific sleep mechanisms (such as sleep spindles or slow waves) and memory systems involved in the postulated "offline reprocessing" while asleep.

Last but not least I will address "residual cognitive processing in disorders of consciousness" (DOC). The fascinating point here is that sometimes "meaningful brain activity" (i.e., similar as seen in healthy brains) is seen in response to environmental cues although overt – and absent – behavior would suggest otherwise. Findings of that kind are of course of outstanding clinical and ethical significance as misdiagnoses in DOC can have far-reaching consequences with respect to life quality and even end-of-life decisions.