Competitive learning modulates memory consolidation during sleep

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Sleep matters: New memory traces are reactivated during post-learning sleep (Wilson & McNaughton, 1994).

Competition matters: Competition between memories during wake can cause memory weakening (Norman, Newman, & Detre, 2007; Lewis-Peacock & Norman, 2014).

Prediction: When memories compete during wake, cueing them during sleep via targeted memory reactivation (TMR) will rekindle this competition and cause memory weakening.

Phase 1: Sound · item over-learning

Encoding

Testing

Under separate pair learning, cueing tended to help one item, but not both

Under competitive learning, cueing impaired memory for well-learned items & sound-item pairs

Phase 2: Item · spatial location learning

Separate-pair learning (SPL) condition

Separate-pair learning (CPL) condition

Try to maximize your score.

Try to maximize your score.

Phase 3: Pre-nap spatial memory test

W
REM
S1
S2
S3
Cue period

Phase 4: 90-min nap

Phase 5: Post-nap spatial + sound-item test

Take-home messages
- Competition strongly modulates the effects of TMR
- Cues impair memory in competitive-pair learning
- Under separate learning, cues benefitted only one memory, showing possible reactivation bandwidth limit
- Beta power indexed competition and memory weakening

Post-cue beta power negatively predicted retention and competition-based weakening.

Post-cue sigma power predicted retention and was reduced under high competition.

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