Research Articles on Memory

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1. **Cognitive Neuroscience Perspective on Memory**
   Authors: Sruthi Sridhar, Abdulrahman Khamaj, Manish Kumar Asthana
   Year: 2023
   Content:
   This review integrates research from neuroimaging, electrophysiology, genetics, and behavioral studies, explaining types of memory (working, declarative, non-declarative), mechanisms of consolidation, and roles of structures like the hippocampus, prefrontal cortex, and striatum. It discusses Baddeley's multicomponent model, neural oscillations, large-scale networks, and sleep's role (NREM/REM) in consolidation. Sections describe memory-related disorders (Alzheimer's, PTSD), sleep-based and neuromodulation interventions, and outstanding questions about non-declarative memory.
   Population:
   Draws from >200 studies with healthy children (6+ years), young adults, elderly (including mild cognitive impairment), neurological patients (Alzheimer's, TBI, PTSD), and animals (rodents, primates).
   Tools:
   fMRI, MRI, EEG, PET, n-back and recall tasks, lesion and stimulation studies, genetics, TMR protocols.
   Results:

- Working memory relates to prefrontal-hippocampal networks and is modifiable by task/difficulty or sleep.

- Declarative memory benefits from sleep (esp. slow-wave/REM) via hippocampal replay.

- Age-related loss observed with prefrontal/hippocampal atrophy; declines earlier in those with low education or vascular risk.

Whom they conducted research on:
Healthy and clinical samples across lifespan, at-risk subgroups, extensive work in brain-injury patients.
References:
https://pmc.ncbi.nlm.nih.gov/articles/PMC10410470/

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2. **Memory: Looking Back and Looking Forward**
Authors: John P. Aggleton, Richard G. M. Morris
Year: 2018
Content:
Reviews memory science from early neuropsychology to molecular neuroscience, highlighting discoveries like LTP, episodic/semantic dissociation, and animal/human patient research. Discusses Tulving's dichotomy, optogenetics, neural circuit analysis, reconsolidation, translational progress for aging/disease, and neuroethics of memory manipulation.
Population:
Covers animal studies (mice, rats), primate work, humans: amnesia/TBI patients, elderly, healthy adults, sample sizes up to 20,000+ in meta-analyses.
Tools:
Mazes, fear conditioning, optogenetics, EEG, fMRI, synaptic labeling, clinical/cognitive tests.
Results:

- Hippocampal lesions cause severe episodic memory loss (cross-species).

- Memory "replay" in sleep/rest links to performance improvement.

- Clinical memory modification (e.g., reconsolidation therapy) faces translation challenges.
Whom they conducted research on:
Rodents/primates for circuits and molecules; humans for brain/cognitive studies; brain-injury, aged, and intervention cohorts.
References:

https://pmc.ncbi.nlm.nih.gov/articles/PMC7058235/

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3. **An Update on Recent Advances in Targeted Memory Reactivation (TMR) During Sleep**
   Authors: J. Carbone et al.
   Year: 2024
   Content:
   Synthesizes studies of TMR—cues like sounds/odors delivered during sleep to bias memory reactivation or weakening. Covers EEG/oscillation-based cue timing, learning-type specificity (factual, spatial, skill), practical applications for education, PTSD, and emotional learning, as well as interindividual differences and limitations of TMR.
   Population:
   Studies range from dozens to hundreds per experiment, including healthy adults (18–79), elderly with cognitive risk, PTSD/anxiety patients, children with learning disabilities.
   Tools:
   EEG/polysomnography, behavioral testing (recall, recognition, VR), sleep tracking at home, closed-loop TMR methods.
   Results:

- TMR can increase recall/skill by 10–25%.

- Most effective in slow-wave sleep; incorrect cue timing may weaken memory or have no effect.

- Clinical trials indicate reduction in trauma recall arousal; potential for classroom learning gains in children.
  Whom they conducted research on:
  Healthy adults, older adults at dementia risk, children, clinical sufferers (PTSD, anxiety).
  References:
  https://www.nature.com/articles/s41539-024-00244-8

4. **Memory: Neurobiological Mechanisms and Assessment**
   Authors: S. Mujawar et al.
   Year: 2021
   Content:
   Explains the division of memory types, relevant brain regions, and ways to assess function—both cognitively and neurally. Presents evidence for dissociation in damage patterns (hippocampal/temporal vs. basal ganglia/frontal), test protocols (MMSE, story/digit recall), and links between neural impairment and cognitive loss in Alzheimer's, frontotemporal dementia, and psychiatric conditions.
   Population:
   Draws on major memory clinic studies (hundreds–thousands per sample), population statistics from US/EU (10% dementia in 65+, <1% young adults with disorders), children with developmental memory loss, animal models for basic research.
   Tools:
   MRI/fMRI, PET, cognitive tests (Corsi, digit span), formal diagnostic screens (MMSE, MoCA).
   Results:

- Brain imaging confirms memory system "double dissociations" and maps out years-long, preclinical Alzheimer's changes.

- Early clinical tests can identify subtle cognitive decline.
  Whom they conducted research on:
  Older/elderly with or without memory losses, young adults, children, and animals.
  References:
  https://pmc.ncbi.nlm.nih.gov/articles/PMC8611531/

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5. **Working Memory From the Psychological and Neurosciences Perspectives**
   Authors: W. J. Chai, N. S. Hamid, N. D. Abdullah

Year: 2018

Content:

Covers psychological and neuroscientific models, with a thorough treatment of working memory systems, neural circuits, age-related change, disease implications (ADHD, dyslexia, TBI, schizophrenia), education impacts, “activity-silent” working memory, and outcomes of computerized training/interventions.

Population:

Draws from meta-analyses and studies with 30–2,000 participants per dataset, up to 50,000 in pooled analyses: healthy childhood to elderly lifespan (global samples), ADHD/dyslexia (2–10% worldwide), neuropsychiatric patients, neurodiverse youth, and cultural comparison groups.

Tools:

Behavioral (n-back, operation span, Corsi), neuroimaging (fMRI, EEG/ERP), cognitive training, intervention evaluation.

Results:

- Working memory declines midlife-onward, worse with comorbid health risks.

- ADHD/dyslexia linked to phonological/visuospatial WM deficits.

- Training gives moderate short-term gains, weak generalizability.

Whom they conducted research on:

Children to elderly, neurodiverse and clinical groups, cross-cultural samples.

References:

https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2018.00401/full