The Human Amnesic Syndrome
• Impaired new learning (anterograde amnesia), exacerbated by increasing retention delay
• Impaired recollection of events learned prior to onset of amnesia (retrograde amnesia, remote memory impairment), often in temporally graded fashion
• Not limited to one sensory modality or type of material
• Normal IQ, attention span, “nondeclarative” forms of memory

Recent/Remote Distinction
• Three patterns of RA
  – Temporally-graded
  – Temporally-limited
  – Decade-nonspecific
• Typically see both AA and RA in amnesia (“no RA without AA”) – but there are exceptions
• Selective (focal) retrograde amnesia

Frontal/Executive Contributions to Memory
– Temporal ordering (“time tagging”) of memories
  • Contextual aspects of memory
– Source memory (memory for where information was learned)
– Metamemory (“feeling of knowing”)
– Intentional aspects of memory/prospective memory (“remembering to remember”)

Theoretical Accounts of Amnesia
1. Encoding deficit
   • Amnesics have difficulty organizing and learning TBR information for later recall
   • Evidence from LOP studies
   • Can explain: AA (impairment in new learning, or recent memory)
   • Has difficulty explaining: shrinking RA

2. Consolidation deficit
   “post-encoding” deficit: difficulty in the consolidation of TBR information
   • Huppert & Percy (1979): accelerated rates of forgetting
   • Can explain: rapid forgetting in amnesia
   • Can’t explain: extensive RA

3. Retrieval deficit
   • Studies showing amnesics are abnormally susceptible to interference
   • Retrieval is often aided by cuing
   • Inconsistent performance across testing situations
   • Indirect versus direct tests of memory
• Helpful in explaining some *retrograde* deficits

**Spared Abilities in Amnesic Disorders**
1. Attention span (e.g. digit span)
2. Measured intelligence
3. ‘indirect’ forms of memory (nondeclarative)
   • Skills; skill learning (rotary pursuit, mirror tracing or reading)
   • Priming (perceptual and conceptual)
   • Conditioning
   • ‘familiarity’

**Word-Stem Completion**
1. IMM_______
2. GRA_______
3. PRO_______
4. PAR_______
5. HOL_______
6. CHI_______

**Word-Fragment Completion**
1. A L _ _ G A _ O _
2. T_B_ O G _ N
3. E _ E _ A _ O _
4. G _ R _ _ _ F _

**Explicit and Implicit Memory**
• Explicit memory
  - Conscious recall of to-be-remembered (TBR) information
  - Supposedly measured through DIRECT tasks
• Implicit memory
  - Unconscious or unintentional recollection of previously-presented material
  - Supposedly measured through INDIRECT tasks

**Examples of Direct and Indirect Tests**
• Direct tests
  - Free recall
  - Recognition
• Indirect tests
  - Word-stem completion
  - Word-fragment completion
Explicit-implicit dissociations: Systems vs. Process Debate

- Systems: IM and EM represent two separate memory systems (functionally and anatomically)
- Process: IM & EM differ in terms of the underlying processes involved in task performance
  - Conceptual versus perceptual processing

The “Systems” View: Characteristics of a Memory System

- Direct and indirect tests tap different processes within the same memory system
- Crux of the argument: processes at “study” match those at “test” for successful performance (ESP, or more broadly “transfer-appropriate processing”)
- Data-driven: indirect tasks (implicit)
  - Perceptually based
  - Modality dependent
- Conceptually-driven: direct tasks (explicit)
  - Conceptually based
  - Modality independent

Process-Based Explanations of Amnesia

- Systems: Amnesia disrupts the system responsible for explicit, not implicit memory
- Process: Amnesia represents an impairment in conceptual processing, regardless of the test type
  - Perceptual processing is intact on both direct and indirect tests

Characteristics of Conceptual and Perceptual tests

- Current data is favorable for both system and process views
- Multiple forms of memory are represented by a distributed memory system
- Fractionated memory impairments possible with subtotal damage to memory system

Synthesis

Two-Process Theory
(Mandler, Jacoby)

- Recollection: a ‘controlled’ process in which there is conscious retrieval of a prior learning episode
- Familiarity: an ‘automatic’ process in which the results of prior exposure or processing lead to a feeling of familiarity or ‘perceptual fluency’

Recollection/ Familiarity

Process Dissociation Procedure

- Opposing recollection and familiarity
- Inclusion vs. exclusion test
- Derive formulae to calculate recollection and familiarity from performance data
- Many manipulations (e.g., age, dividing attention) affect recollection but not familiarity
Problems with Process-Dissociation
• Assumes independence of recollection and familiarity; however R and F are often correlated
• Seriousness of this problem depends upon mode of retrieval/instructions
  – Generate-recognize (first word that comes to mind): R & F not independent
  – Direct retrieval (use cue for retrieval): Assumption of independence more tenable

Remember-Know
• Two subjective states of remembering
• Seem to be relatively independent
• Many variables affect remembering but not knowing
• ERP’s distinguish R vs. K words irrespective of study history
• Lorazepam reduces remembering and leaves knowing intact

Functional Neuroimaging of Memory
• Allows evaluation of “in vivo” memory performance
• Allows evaluation of extended networks of memory
• Some techniques allow real-time assessment

Functional Imaging of Explicit Memory
• HERA (hemispheric encoding-retrieval asymmetry) model
  – Encoding preferentially associated with LDLPFC activation
  – Retrieval preferentially associated with RDLPFC activation

But there’s also material-specificity

Functional Imaging of Explicit Memory 2
• Prefrontal, MTL responses greater during learning if items eventually remembered
• Hemispheric asymmetries in material (verbal vs. nonverbal)
• TP differentiated from FP
• Hippocampus active during encoding, less so during retrieval

Multiple Trace Theory
• Previous studies suggest hippocampus important in laying down a new memory but becomes less important over time
• MTT suggests, in contrast to standard model, that hippocampus is always involved in retrieval of autobiographical memories, however old

Dissociations of forms of memory
• Selective impairment in STM with preserved LTM
• I mpairment in semantic memory with relatively preserved episodic memory (e.g., semantic dementia)
• Selective retrograde amnesia
• Selective impairments in skill learning and priming

Five Memory Systems (Schacter et al., 1994, 2000)
• Working Memory
• Episodic Memory
• Semantic Memory
• Perceptual Representation System
• Procedural Memory

Metamemory
• Thinking about thinking
• Allows control of retrieval
• RJR (recall-judge-recognize)/FOK paradigm
• Theories (all explain some data)
  – Target retrievability hypothesis
  – Cue familiarity hypothesis
  – e.g. CHARM (monitoring/control prior to retrieval)
  – Accessibility heuristic (e.g. speed of access)

Metamemory: Sample findings
• Tip-of-the-tongue phenomenon
  – Can recall phonemic information, number of syllables, gender of speaker, etc. Strongest evidence for accessibility hypothesis
• Retrieval Latency
  – Game show paradigm: FOK or actual retrieval by “fast fingers”. Responses faster in FOK than in retrieval. Favor cue-familiarity hypothesis.
• Knowing not
  – Judgments about what is not known are made accurately and very quickly. Appears to be positively marked and immediately accessible.
• Dissociation between FOK and recognition
  – Seen in some forms of amnesia (e.g., Korsakoff patients) but not in others. May be attributable to frontal lobe impairment in self-monitoring

Reconstructive Memory
• Reconstructive vs. reproductive
• Paradigms
  – Post-event manipulations
  – Minsinformation acceptance
• Associated phenomena
  – “Own” bias
  – “Hindsight” bias
• Clinical implications: self report