

1 Memory II

October 2, 2008

2 

3 

4 

5 

6 

7 

8 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

9 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”)
- Selective (focal) retrograde amnesia

10 

11 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”)

12 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

13 Theoretical Accounts (cont.)

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

14 Theoretical Accounts (cont.)

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

15 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’

16 

17 

18 

19 

20 Word-Stem Completion

1

• IMM_____

• GRA_____

• PRO_____

2

• PAR_____

• HOL_____

• CHI_____

21 Word-Fragment Completion

- 1 • A L _ _ G A _ O _
- T _ B _ O G _ N
- E _ E _ A _ O _
- G _ R _ _ _ F _

22 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

23 Examples of Direct and Indirect Tests

- Direct tests
 - Free recall
 - Recognition
- Indirect tests
 - Word-stem completion
 - Word-fragment completion
 - Lexical decision
 - Picture fragment identification

24 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

25 The “Systems” View

- What is a memory “system”?
 - Class-inclusion operations (defines a particular class, or category, of operations)
 - Properties and relations (describes how the system works, kinds of information the system handles, neural substrates)
 - Convergent (double) dissociations (functional, anatomical)
- Implicit-explicit distinction entails different memory systems
 - Conscious, deliberate nature of retrieval
 - Different neural substrates (limbic vs. cortical; limbic v. striatal)
 - Stochastic independence

26

27 The “Process” view

- 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

28 ☐ 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

29 ☐ Characteristics of Conceptual and Perceptual tests

1

- Perceptual
 - Modality-dependent (changes in modality between study and test adversely affect performance)
 - Meaning-independent
 - Based on physical or sensory characteristics

2

- Conceptual
 - Modality-independent
 - Meaning-dependent (changes in meaning between study and test adversely affect performance)
 - Based on semantic characteristics

30 ☐

31 ☐

32 ☐

33 ☐

34 ☐

35 ☐

36 ☐

37 ☐ Synthesis

- 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

38 ☐ 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'

39 Recollection/Familiarity

40 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

41 

42 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

43 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

44 Functional Neuroimaging of Memory

- Allows evaluation of "in vivo" memory performance
- Allows evaluation of extended networks of memory
- Some techniques allow real-time assessment

45 Functional Imaging of Explicit Memory

- HERA (hemispheric encoding-retrieval asymmetry) model
 - Encoding preferentially associated with LDLPFC activation
 - Retrieval preferentially associated with RDLPFC activation

46 But there's also material-specificity

47 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

48 

49 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

50 

51 

52 

53 Dissociations of forms of memory

- Selective impairment in STM with preserved LTM
- Impairment in semantic memory with relatively preserved episodic memory (e.g., semantic dementia)
- Selective retrograde amnesia
- Selective impairments in skill learning and priming

54 Five Memory Systems (Schacter et al., 1994, 2000)

- Working Memory
- Episodic Memory
- Semantic Memory
- Perceptual Representation System
- Procedural Memory

55 Metamemory

- Thinking about thinking
- Allows control of retrieval
- RJR (recall-judge-recognize)/FOK paradigm
- Theories (both are probably right)
 - Target retrievability hypothesis
 - Cue familiarity hypothesis
 - e.g. CHARM (monitoring/control prior to retrieval)
 - Accessibility heuristic (e.g. speed of access)

56 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

57 Reconstructive Memory

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

58 Other Research Domains (a sampler)

- Memory and emotion (see last lecture)
- Everyday (nonlaboratory) memory
- Prospective memory
- Spatial memory for landmarks and maps
- Subject-performed-tasks