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Class Meets: Weekdays 1:30-4:00pm @ 9B114

SKKU ISS3147

Myths and Mysteries of Human Learning and Memory

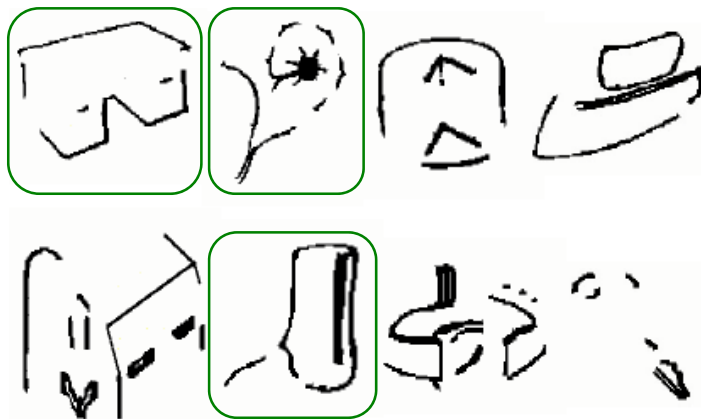
Implicit Memory

1 Jul 2016

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Research Report

Nonconscious Priming After 17 Years

Invulnerable Implicit Memory?

David B. Mitchell

ABSTRACT—Individuals who saw pictures for 1 to 3 s in the laboratory were tested 17 years later by mail. Identification rates were significantly higher for fragments from these previously exposed targets than for novel fragments, whereas the same stimuli evoked no differences in control groups that had not been previously exposed to the pictures. Priming—the memorial advantage conferred by prior perceptual experience—was stable over the years ($r = .51$). Priming was dissociated from episodic memory, in that it was present even in subjects who reported no conscious recollection of their participation in the original laboratory session. These findings suggest that the perceptual representation system is an invulnerable memory system functioning below conscious awareness.

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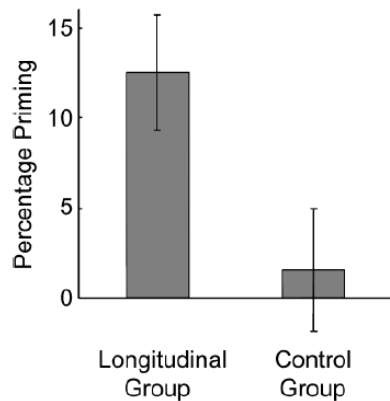


Fig. 1. Mean picture-fragment identification priming in the longitudinal group after 17 years and in a control group with no prior exposure. Error bars indicate standard error of the mean.

Dissociations Between Explicit and Implicit Memory

Four subjects confessed that they had no conscious recollection of their laboratory visit 17 years earlier:

- "I'm sorry—I don't really remember this experiment at all." (36-year-old male, 22% priming)
- "I'm afraid I don't recall participating at all." (37-year-old female, 7% priming)
- "Don't remember anything about it." (36-year-old female, 33% priming)
- "Basically, I remember nothing about the experience" (46-year-old male, 14% priming)

Apparently, these individuals *knew* they had participated in psychology experiments during their undergraduate years, but could not *remember* this particular experience.

(Mitchell, 2006)

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Reading inverted text

Եւրաշիւն իս ասիոց ԲՕ ՕՇՈՒ ԻԷ
 Եւսսւրիւն ԶՄ ԻԲԵՄ ԻՄԷԼՆԵՄՇԵՆ ԻԲՔ
 ՆՈՐԱԵԴՆԵՄԲ ԵԵԽՇԵԲԵԼՈՒ ՕՒ ԵՒՕՇՆԱԻՄՆՁ
 ԷՕՒ ԵՃԱՄԵԴ՝ ՆՈՒ ՄԻՃՄԲ ԲԵ ԻԵԴՈՒԷԳ ԲՕ
 ԻԵՅԳ ՕՈԲ Զ ԻԻՏԲ ՕԷ ՄՕՒԳՔ ԶՄԳ ԲՄԵՄ՝ ԻՄ
 ԶՄ ԶԵԵԻՄԲԵԼՆ ԶԵԵԻՏԲԵ ԵՃԵԻՄՄԵՄԲ՝ ԲՕ
 ԵԵԽՇԵԼԵ ՄՕՒԳՔ Եւսսւրեգ ՆԵԼՆ
 ԲԻԷԷԼՆ՝ ԸՄՕՇԵ ՄՕՒԳՔ ԲՄԲԲ ՆՈՒ ԲՅԳ
 ԻԵՅԳ ՄՈՒԵԳ ԲԵ ՄՕԷ ԻԻԷԷԼ ԲՕ ԲԵ
 ԳԵԲԵԲԵԳ ԲՄՅՄ ՄԵՄ ՄՕՒԳՔ՝ ԵՆԵՄ ԲՄՈՒՃՄ
 ՆՈՒ ՄԻՃՄԲ ՄՕԲ ԲԵ ԶՐԵ ԲՕ ԻԵՄԵՄԲԵԽ ԲՄԵ
 ՕԵԳ ՄՕՒԳՔ՝

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Reading inverted text

Kolers (1975, 1976)

College students read 160 pages of inverted text.

1st page: took ~15 min to read (cf. 1.4 min for a page of normally-oriented text).

160th page: took 1.7 min to read.

13-15 months later, the same subjects given inverted text to read again.

1st page: took ~4 min to read

(Noticeable savings of the skill acquired over a year ago)

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surgery

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Word fragment
identification

_p_d_r

_h_ck_r_

s__tu_a

_yr_mi_

_ku_k

Anagram solution

ragtyde

urgesyr

whsado

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Implicit memory – the type of memory demonstrated through *indirect* tests, in which memory is expressed without reference to a prior learning episode.

Priming – a change (often a facilitation) in task performance as a result of prior experience (relative to a baseline performance measure); the measure of implicit memory in most laboratory tasks.

Explicit memory – the type of memory expressed (on *direct* tests) with awareness of a prior learning episode; involves an intentional attempt to retrieve.

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EXPLICIT MEMORY: Intentional Retrieval

Tested by direct measures of memory: recall and recognition.

IMPLICIT MEMORY: Incidental Retrieval

Effects of past experience on current behaviour without any intention to retrieve from memory.

Tested by indirect measures of memory: priming

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Explicit Memory Tests

Subjects are asked to intentionally recollect prior experiences. E.g.,

- Free recall
- Cued recall
- Recognition
- Serial recall

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PERCEPTUAL IMPLICIT MEMORY TESTS

Word fragment identification

Picture fragment identification

Anagram solution

Word stem completion (ele_____)

Word identification (from a very brief presentation)

Most of the attention in implicit memory research has focused on *perceptual* implicit memory tests.

CONCEPTUAL IMPLICIT MEMORY TESTS

General knowledge questions

What is the name of an airplane without an engine?

Category exemplar generation

Say the first 10 animals that come to mind.

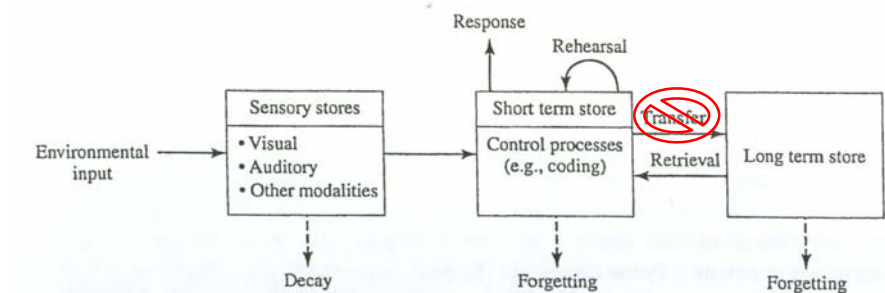
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WHY IS IMPLICIT MEMORY INTERESTING?

2 reasons...

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Around 1970, amnesia was explained well by two-store models of memory



Brain damage seemed to cause a **lack of transfer** from short-term to long-term store.

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But this story was complicated by the introduction of implicit memory tests

4 patients with amnesia; 8 control subjects

Stimuli: 24 5-letter words, presented 3 x

4 types of tests:

- Free recall
- Free choice recognition (i.e., Yes/No or Old/New)
- Word fragment identification (slightly different from the version we talked about earlier)
- Word stem completion

CHA__

CAB__

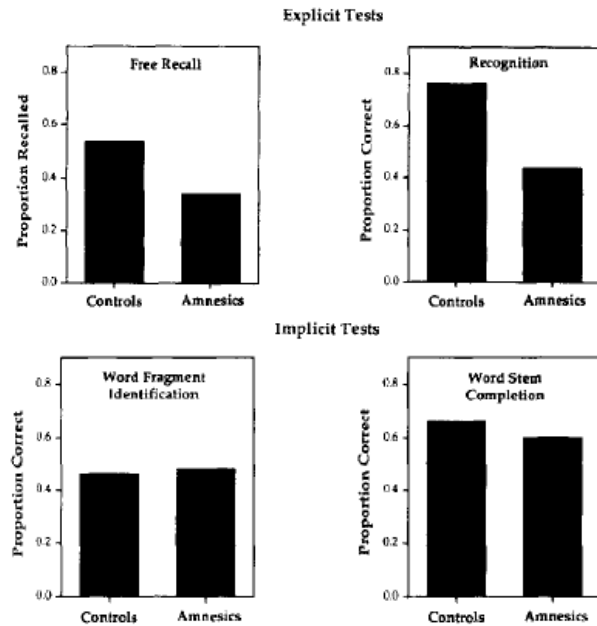
MET__

METAL
METAL
METAL

(Warrington & Weiskrantz, 1970)



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(Warrington & Weiskrantz, 1970)

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“DISSOCIATION”

(A kind of interaction.)

Test 1: $A > B$

Test 2: $B > A$ (or $A = B$)

There was a *dissociation* between implicit and explicit memory: amnesic patients performed worse than control subjects on explicit memory tests, but had intact performance on implicit memory tests.

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The Information That Amnesic Patients Do Not Forget

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The performance of three kinds of amnesic patients and control subjects was assessed using four methods for testing memory: free recall, recognition, cued recall, and word completion. Whereas amnesic patients were impaired on free recall, recognition, and cued recall, they were normal on word completion. Moreover, performance on the word-completion test declined at a normal rate reaching chance after about 120 min. The word-completion test resembled the cued-recall test in that the initial letters of previously presented words were given as cues. It differed from cued recall only in the instructions, which directed subjects away from the memory aspects of the test and asked them to complete each three-letter cue with the first word that came to mind. The present results offer an explanation of conflicting findings that have been obtained with amnesic patients on tests of the cued-recall type. The results are considered in terms of a process (activation or procedural learning), which is spared in amnesia and not dependent on the integrity of the damaged brain regions.



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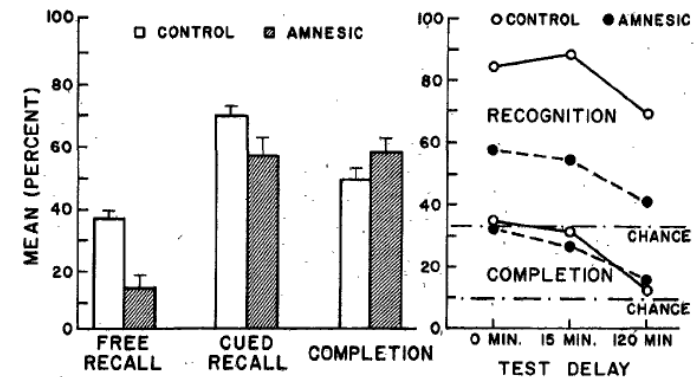


Figure 4. Summary results from Experiments 1, 2, and 3 showing performance in one of the orienting conditions (the liking task) for all amnesic patients and control subjects. (Amnesic patients showed normal word-completion performance [left panel] and normal decline of word-completion performance with time [right panel]. They were impaired in free recall [left panel], recognition memory [right panel], and in cued recall [left panel], a test that is closely related to word completion but that differs from it in a critical way, that is, by the instructions given to the subjects. Error bars show standard errors of the mean.)

*The only difference between the “cued recall” and “completion” tests was that in the former, subjects were asked to use the first 3-letters as a cue to help them recall words from the study list, whereas in the latter, they were simply asked to write down “the first word that comes to mind.”

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More about amnesia next Thursday.

For now... people with amnesia *can* benefit from prior experiences; they exhibit intact implicit memory.

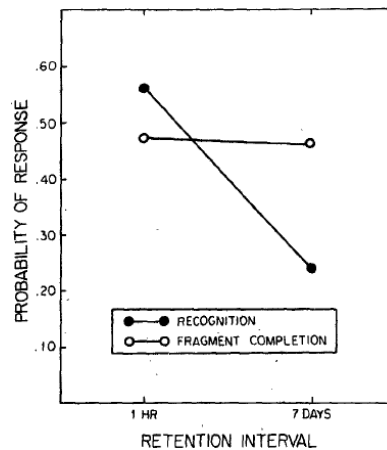
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WHY IS IMPLICIT MEMORY INTERESTING?

2 reasons:

- Amnesic patients show normal implicit memory
- Within normal subjects, the patterns of results (for implicit memory tests) are often different from those seen in explicit memory. *Another dissociation!*

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Examples of word fragments used:

a _ a _ in

c _ _ ar _ t

_ ys _ _ ry

_ e _ d _ l _ m

_ h _ o _ em

No forgetting over a week for a perceptual implicit memory test.



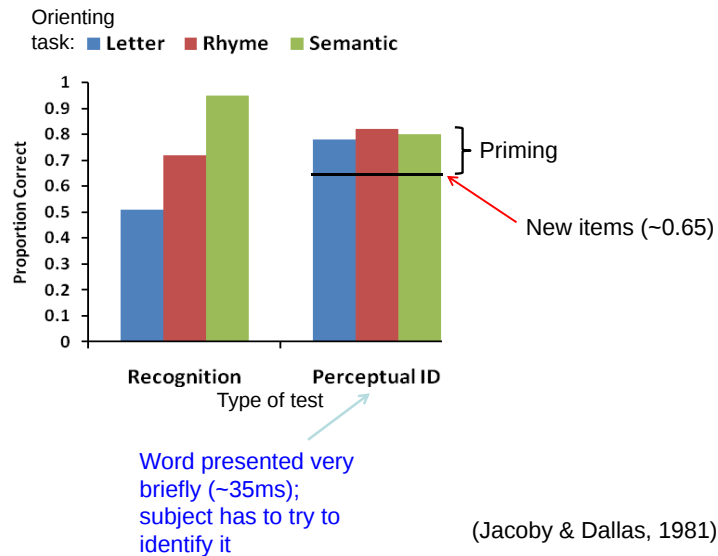
(Tulving, Schacter, Stark, 1982)

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LEVELS OF PROCESSING: *NO EFFECT* ON PERCEPTUAL PRIMING



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GENERATION EFFECT

Three Study Conditions:

		Response
No Context	XXX - night	"night"
Context	day - night	"night"
Generate	day - ???	"night"

Two tests:

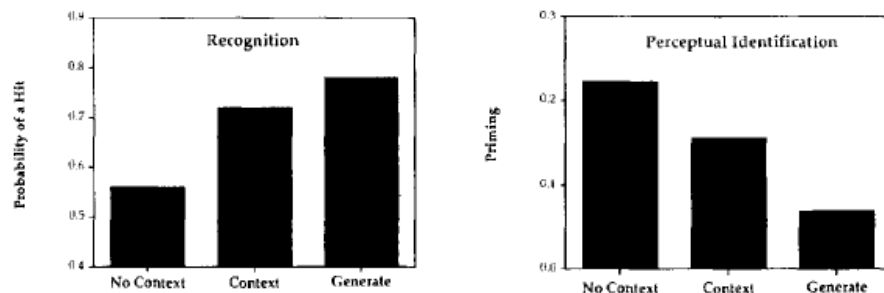
Yes/No recognition
Perceptual identification



(Jacoby, 1983)

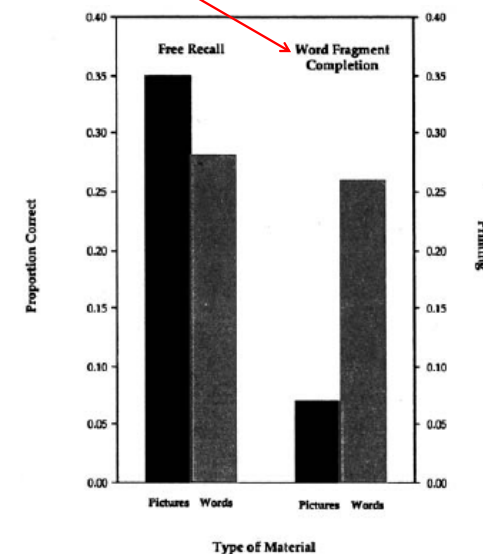
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REVERSE GENERATION EFFECT ON AN IMPLICIT MEMORY TEST



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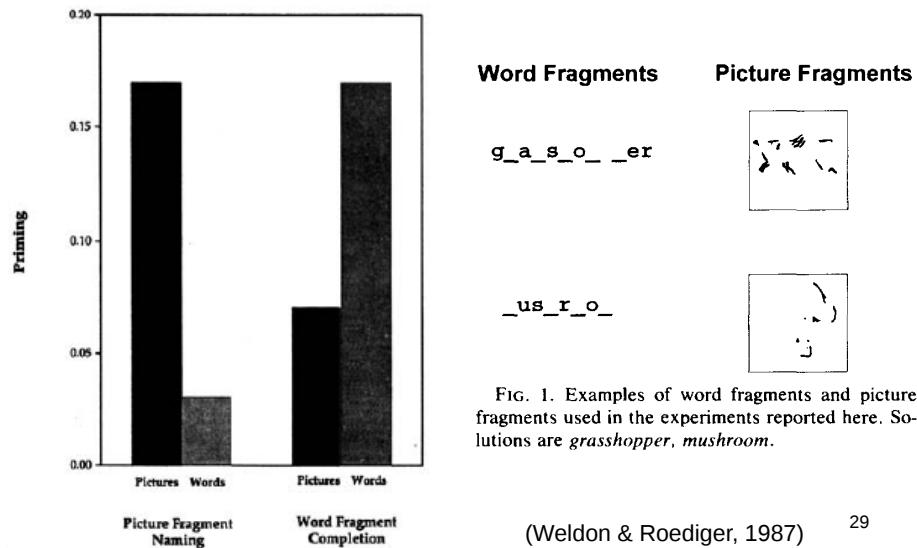
Reversal of the Picture Superiority Effect in an Implicit Memory Test



(Weldon & Roediger, 1987)

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Reinstantiation of the Picture Superiority Effect in a Different Implicit Memory Test



Unlike perceptual implicit memory tests, conceptual implicit tests show many of the same patterns as explicit tests:

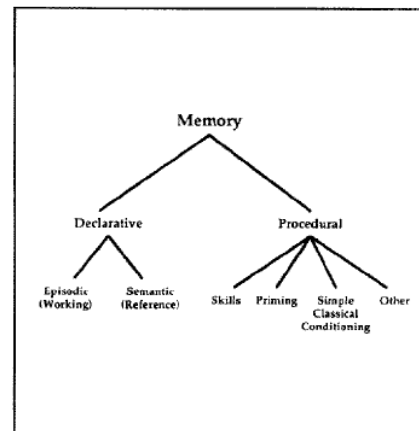
- Generation effect
- Levels of processing effect

Theoretical explanations of implicit memory

i) Memory systems

ii) Transfer appropriate processing

Schematic Representation of Squire's (1987) Theory Postulating Distinct Memory Systems.



MEMORY SYSTEMS VIEW OF IMPLICIT MEMORY

Implicit/explicit memory can be explained by 2 separate systems—one underlying implicit memory, one underlying explicit memory

Consistent with findings from amnesic patients.

But dissociations are easy to obtain from different tasks/tests... many more systems proposed... unparsimonious.

TRANSFER APPROPRIATE PROCESSING (AS APPLIED TO IMPLICIT MEMORY)

1. Performance on memory tests benefit to the extent that the cognitive operations involved at test recapitulate or overlap those engaged during initial learning.
2. Implicit memory tests usually require different mental processes from explicit tests, and consequently benefit from different types of processing during study/learning.

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TAP VIEW OF IMPLICIT MEMORY

Different tests call upon different processing requirements.

Dissociations between implicit and explicit memory tests are viewed as special cases of TAP.

Most explicit tests call upon conceptual processing; implicit tests such as word fragment identification & word stem completion call upon perceptual processing.

Parsimonious. Accounts for most of the data in normal subjects.

Doesn't account too well for findings in amnesia.

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Any questions?

... if not, then it's time for Exam 1

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