

Have I SEEN that before?  
Theories of recognition memory

Structure of talk

- Memory strength theory
- Challenges to memory strength theory
  - Dual-process theories
    - RK theory
    - Attributional theories
  - Source-memory theory
    - Detour into unconscious plagiarism errors



Memory strength theory

**PART 1**



Memory strength theory

- *The dominant model of memory*
  - Ideas (memories) differ in “strength” of representation in mind.
  - Various factors influence the strength of an idea:
    - Frequency of exposure
    - Encoding
    - Rehearsal
    - Distinctiveness
    - Delay
    - etc

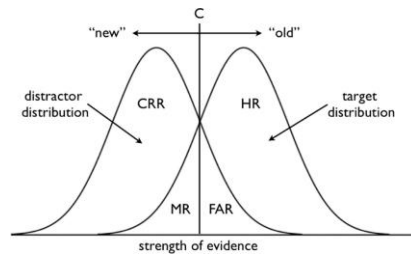


Strength theory

- Recognition items (targets / foils) elicit a signal from the memory system.
  - Basic idea can be realised in different ways. (Vectors / Neural nets / features)
- This output is then subject to a decision process.
  - People have control over response bias.
- Most common view of decision process is SDT.



Signal detection theory



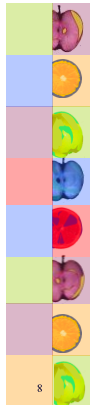
### Essentials of SDT

- “Memory” is the ability to discriminate signals from noise.
  - Measured by  $d'$
- Metacognitive control is modelled by response bias,  $c$  (or  $\beta$ ).
  - Response bias = Confidence ratings
- Can be expanded by assuming:
  - 2 or more thresholds.
  - Unequal variance across distributions



### Signal detection theory

- Is really a theory about how decisions are made, based on a (single) underlying dimension, rather than being a memory theory per se.
  - Doesn't preclude underlying dimension having multiple components (Wixted & Stretch, 2004).



### Type 2 Signal Detection theory

- Standard (type 1) SDT examines the ability to discriminate targets from foils.
- Type 2 SDT looks at the ability to discriminate correct responses (H / CR) from incorrect responses (M / FA).
  - It is a means of measuring metacognitive monitoring.
  - Better monitoring measured by type-2  $d'$ .
  - Bias (towards thinking oneself correct or incorrect) measured by type-2  $c$ .

Higham, Perfect & Bruno, 2009



### Memory strength theory

- Fundamental claim is that ALL recognition memory performance can be understood as variations in strength along a single (decision) dimension.
- The alternative view is that 2 separate forms of recognition memory exist.

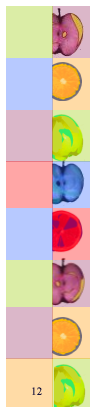


Dual process theories of recognition

## PART 2

### Tulving's (1985) two-process experiential account

- We experience our knowledge of past in 2 distinct ways:
  - Knowing / Familiarity
    - Without sense of reliving event
    - Context-free
  - Recollection
    - Mental reliving of past (“mental time travel”)
    - Contextualised.



### Developments of R / K theory

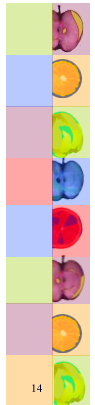
- Gardiner pioneered the use of RK methodology, demonstrating numerous dissociations.
- Yonelinas proposed a theoretical model in which:
  - Familiarity (K) varies continuously in strength.
  - Recollection (R) is a discrete all-or-none event.



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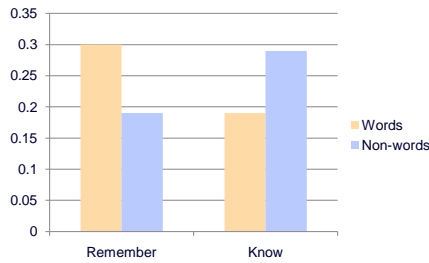
### Evidence for dual processes

- Several lines of evidence used to support the dual-process account
  - Subjective experience
    - "the butcher on the bus"
  - Experimental dissociations
  - Neuropsychological evidence



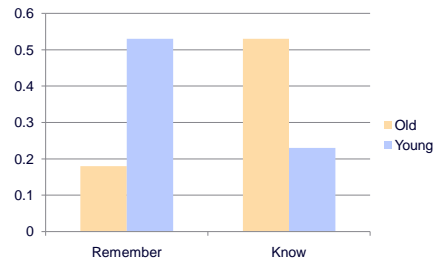
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### Example dissociation: Gardiner & Java (1990)



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### Another example: Perfect, Williams, & Anderson-Brown (1995)



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### R vs K dissociations

- Factors that affect R but not K
  - Elaboration
  - Divided attention
  - Generation effect
- Factors that affect K but not R
  - Perceptual processing
  - Modality shifts
- Factors that affect both
  - Delay

Gardiner & Richardson-Klavehn (2000)

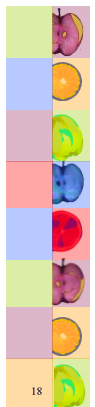


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### Neuropsychological evidence for R / K dissociation

- R and K responses share activity in regions associated with judgement of "oldness" (i.e. discriminate hits from CRs).
- R judgements alone are associated with areas associated with encoding item within its context. The location varies with original encoding.
  - i.e. R = reinstatement of original study context.

Johnson & Rugg, 2007



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### Complications for RK theory

- A big debate whether RK responses reflect underlying processes directly, or indirectly.
  - Common assumption is to assume independence, not redundancy.
  - Recall = Prop R responses:  $P(R)$
  - Familiarity = Prop of not-R responses that are given a K response.  $P(K)/P(1-R)$



### Problems with measurement

- Recent move towards “cleaning” up data on K responses by including a “guess” category. **RKG**
- Some have suggested distinction between “Know” and “Familiar”. **RKFG**
- At present the literature is a bit of a mess because of differences in the methodology.

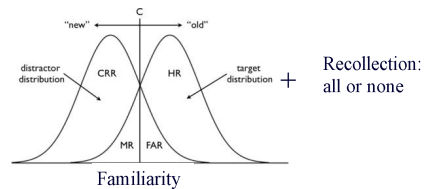


### Current positions in RK theory

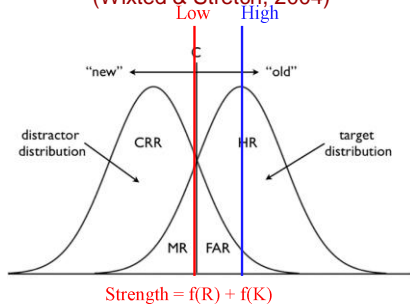
- R & K represent independent processes leading to recognition (Gardiner, Tulving).
  - Familiarity is continuous, Recognition is all or none (Yonelinas)
- R & K summate to create recognition.
  - Weighted by task context (Wixted & Stretch, 2004)
- R is a metacognitive “add on” to recognition, which is based on familiarity.
  - (Dunn, 2008).



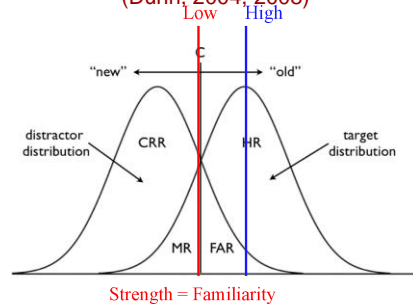
### Signal detection theory – Yonelinas



### Signal detection theory – two thresholds (Wixted & Stretch, 2004)



### Signal detection theory – two thresholds (Dunn, 2004, 2008)



### Single vs Dual process debate

- Big debate on whether 2 processes are necessary.
  - Some (Donaldson, Dunn) have argued that the dissociations can be modelled by 2 thresholds.
  - Counter-argument is that these models require implausible assumptions about threshold changes (c.f. mirror effect literature).
  - Neuropsychological evidence supports 2 processes.



### Summary of RK theory

- There are 2 processes that can be directly tested through self-report.
- There is evidence that they can be dissociated.
- Ongoing debate about the meaning of these dissociations.



### Attributional dual-process accounts

- E.g. Jacoby / Whittlesea
  - When we encounter a stimulus
    - We may experience a degree of recollection.
    - We judge the fluency with which we process it.
- (so far, no difference from R/K)
- Interpretation of these states is not direct, but inferred from the context.



### The false fame effect

- Stage 1
  - Participants encounter a number of non-famous names in an irrelevant task.
    - Michael Simpson, Sebastian Weisdorf, Lois Hopwood...
- Delay
- Stage 2
  - Participants judge whether or not presented names are famous
  - Michael Douglas, Jacob Hollins, Kerry Packer, Sebastian Weisdorf...



### False fame as an attribution

- Occurs because the name is familiar without being recollected.
- People make attributions about the cause of the familiarity (in this case fame) driven by the ongoing task.
  - Appropriate briefing prevents this.



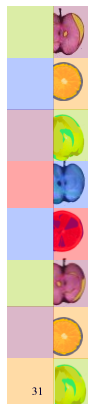
### Jacoby's memory illusions

- In a series of studies, Jacoby & colleagues used the false-fame paradigm to show that people would judge primed items as louder, brighter, having longer duration on screen etc.
- BUT if told that the test contained primed items, these effects disappear.



### The "it-had-to-be-you (me)" effect

- In recognition + reality memory tasks, people often make FP errors
- Where do they come from?
  - "It-had-to-be-you"
- Traditional view is that people assume that "weak" memories are external (e.g. Hoffman, 1997).
- Bink et al (1999) challenged this.



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### Bink et al (1999) It had to be who?

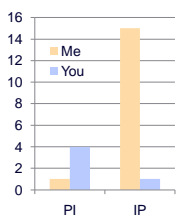
	PI	IP
Day 1	Picture x 1	Imagine x 3
Day 3	Imagine x 1	Picture x 1
Day 3	Mixed list test	

- The question of interest is where do people attribute false positives to?
  - Me (imagine) or You (picture)

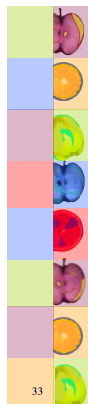


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### It had to be me...



- People attribute the source of FPs as the opposite of the most recent task.
  - This occurs even though actual memory strength was matched.
- i.e. contrary to strength theory.



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### Whittlesea's work

- Whittlesea & Leboe (2003) argued that there are two kinds of fluency that people use:
  - Direct (i.e. Speed of processing)
    - Used only for meaningless material
  - Indirect (speed relative to expectation).
- Familiarity is only experienced when it is unexpected.
  - i.e. the butcher needs to be *on the bus*.



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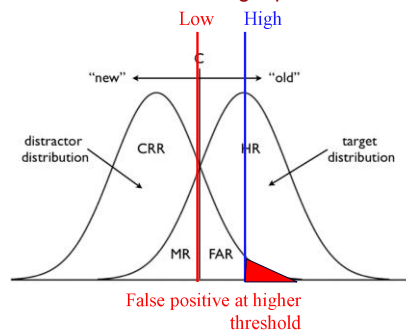
### The problematic issue of false recollection....

- Why do people sometimes claim false recollection of novel items?
  - How can we "relive" something that never happened?
- Single-process theory can explain these errors.



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### False recollection in single-process theory



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### The problematic issue of false recollection....

- Dual-process accounts assume recollection
  - Is a "special" all-or-none state
  - Involving mentally reliving the past.
- Why false recollection?
  - Traditional view is that these are report errors or guesses.
  - But recent evidence shows that such errors are *systematic*.



### Illusory recollection: Dodson, Darragh & Williams (2008)

- Participants heard legal, medical or neutral statements from 2 sources.
- At test
  - told one source was a lawyer / doctor.
  - people asked to recognise statements, attribute source, and make R / K judgements.
- If Recollection is based on "reliving" then new information about sources shouldn't impact R judgements.
- It should be used to attribute source when no other evidence is available: i.e. K judgements.

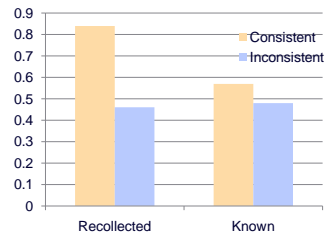


### Illusory recollection

- Expt 1 found that people falsely attributed legal ideas to lawyer, medical ideas to doctor.
- In experiment 2, participants were additionally asked give R / K judgements.
- Then they made their source identification.



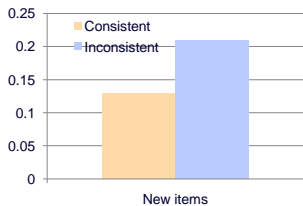
### Sources attributed to old items



People were more likely to make a source-consistent judgement when they "recollected". i.e. stereotypes not just used in the absence of recollection.



### False recollection to new items



No evidence that people just say R whenever the statement is consistent with a source. Hard to reconcile with a criterion account (where a lower criterion is used for consistent items)



### Conclusions?

- Test items are recollected in a manner consistent with stereotypes.
- New items are not.
- The report of recollection isn't a veridical read out of mentally reliving an event.
- It is reconstructed, just like familiarity.



### Illusory recollection 2: McCabe & Geraci (in press)

- Have argued that the *experience* of recollection may be correct.
  - But for the wrong event.
- i.e. People experience “mental time travel” to the wrong time.



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### McCabe & Geraci (in press) Expt 3

- Pre-exposure phase
  - Either gender rating or pleasantness rating of words (Between S's)
  - Test 1 (Old / New recognition)



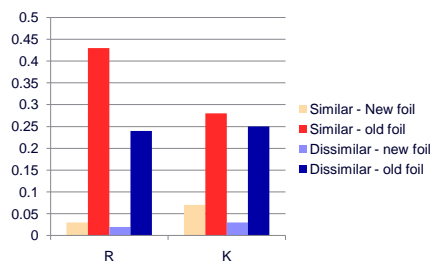
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- Study phase for test 2 (Gender rating)
- Test phase: RK judgements.
  - Old items
  - New foils
  - Familiar foils from phase 1.
    - Similar (Gender encoding for both lists)
    - Dissimilar (Pleasantness then gender encoding)



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### Results – false recollection

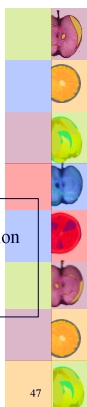
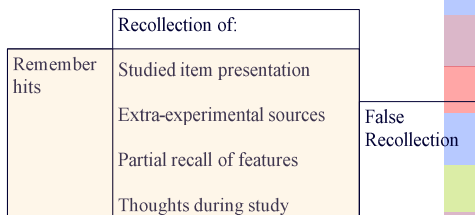


Participants recollect items from the wrong list (despite instructions), particularly in a similar context. Similarity doesn't affect K.



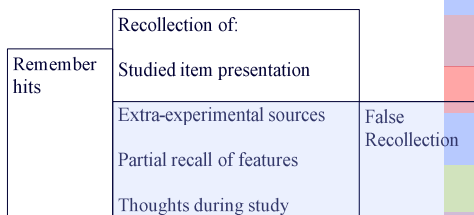
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### McCabe & Geraci's account



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### McCabe & Geraci's account



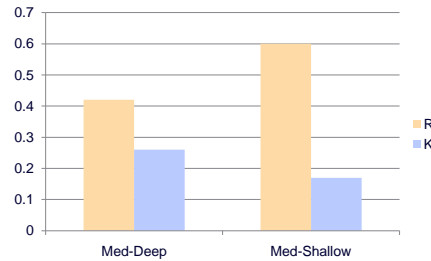
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**Constructed recollection: Bodner & Lindsay (2003)**

- Participants studied lists of items in different encoding & test contexts
- Shallow + Medium LOP
- Deep + Medium LOP
- Looked at ratings of recollection for medium items



**Recollection influenced by context**



**Bodner & Lindsay (2003)**

- Found that this effect doesn't occur if only medium items are tested.
  - The effect is created by text-context interacting with study conditions.
- Concluded that recollection (and knowing) are
  - Context-dependent, *functionally defined* experiences.
  - That is recollection is defined as what allows a person to achieve a task-goal.



**Summary of dual-process theories**

- The shared claim is that there are 2 separable processes in recognition memory.
  - Debate as to whether one or both are attributions about qualitative nature of memory trace, in relation to the ongoing goal.



Source monitoring theory

**PART 3**

**Source monitoring theory**

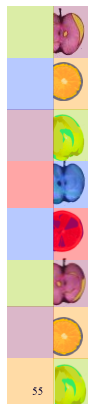
- Memories are multi-dimensional constructs.
- The origin of mental events (including memories) is inferred on-line.
- There are 2 kinds of inferential decision processes
  - Automatic / heuristic
  - Controlled / logical



### Memories are multi-dimensional constructs

- perceptual information (e.g. colour)
- contextual information (e.g. spatial)
- semantic detail (e.g. prior knowledge on topic)
- affective detail (emotional response)
- cognitive operations (e.g. records of elaborating, associating)

Johnson, Hashtroudi & Lindsay (1993)



### Quantity and quality

- In the SM framework, mental events differ both in
  - The kind of information they contain
  - The amount of each kind of information they contain.



### Mental events

- Different kinds of mental events have different properties
  - E.g. real memories have more perceptual details, contextual information.
- Imagined events have more cognitive operations associated with them.
- The quality, and quantity of these properties drive the inference about the origin.



### Decision processes

- Are mostly automatic / heuristic
  - Driven by information available
- But we are capable of applying logic to distinguish source.
  - E.g. déjà vu, reality monitoring.
- The decision process is driven by our goals / ongoing task context.



### Accuracy of SM decisions

- Is driven by the attention paid to source-specifying information.
  - People may not consider the right information
  - Task-goals (e.g. speed) might prevent this.
- Is driven by resources available
  - Ongoing task may prevent ability to evaluate source information



### The same basic principles apply to

- Decisions about real vs imagined events
  - “Reality monitoring”
- Decisions about two external events
  - Seen vs heard details
  - Event 1 vs event 2
  - Source 1 vs source 2



### Source monitoring vs Dual process theories of recognition

#### Dual processes

- Two kinds of memory (recollection/ familiarity)
- Recollection all or none, familiarity continuous.
- Familiarity (and R?) susceptible to attributional bias.
- Recollection under conscious control, familiarity not.

#### Source monitoring

- Memories vary across many dimensions.
- No such assumptions.
- Memory performance driven by relevant qualitative characteristics.
- Two kinds of decision processes heuristic and controlled can be applied.

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### Source monitoring illustration: unconscious plagiarism

- Brown & Murphy, 1989, introduced a 3-stage laboratory paradigm.
- Participants initially generate solutions to problems in a group of 4.
- Delay
- Recall-own ideas
- Generate-new ideas

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### Two forms of Unconscious Plagiarism

- Recalling other's ideas during the recall-own phase.
- **Brown and Murphy: 7.3%**
- Generating old ideas (including self-plagiarism) during generate new phase.
- **Brown & Murphy: 8.6% (including 0.5% self-plagiarism)**

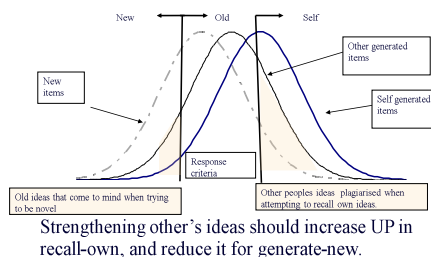
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### Subsequent developments...

- A series of studies conducted in early to mid 1990s using the 3-stage(1989) paradigm.
  - Delay
  - Group size
  - Divided attention / distraction
  - Task difficulty
  - Etc
- This led to a formal model...

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### A (modified) strength based account of the two forms of plagiarism (Landau & Marsh, 1997)



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### Testing the two-threshold account

- Strength theory predicts that factors that increase strength should
  - increase correct recall
  - increase RO plagiarism.
  - Decrease GN plagiarism
- SM theory might predict that people make judgements about source on qualitatively different characteristics than judgements about oldness.

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### Stark, Perfect & Newstead (2005) – 4 stage paradigm

- Participants initially generate solutions to problems in a group of 4.
- Delay
- Elaboration of the ideas
- Delay
- Recall-own ideas
- Generate-new ideas

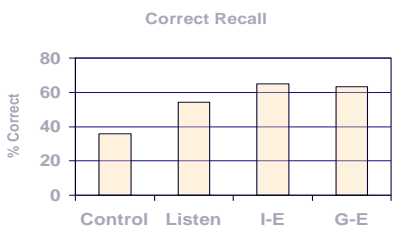


### The elaboration phase

- Generative Elaboration (GE)
  - 3 Idea improvements
- Imagery Elaboration (IE)
  - Idea ratings (5 point Likert scale)
    - How easy to imagine the idea?
    - How effective the idea would be?
- Control – Representation (Listen)
- Control – No representation (Control)



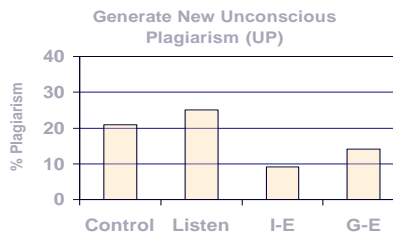
### Stark et al (2005) results



- G-I & I-E ideas both strengthen memory equally.



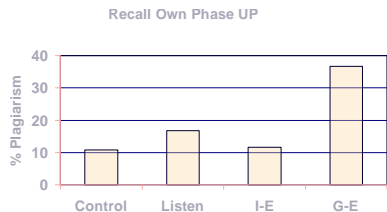
### Stark et al (2005) results



- Elaboration (of either kind) reduced plagiarism: ideas more readily rejected as old – compatible with model of strength threshold for GN.



### Stark et al (2005) results



- Participants reports that other's ideas were their own only increased (relative to control) after improving them.
- Not compatible with threshold account for recall-own.



### Replications

- Improvement has effect...
  - With financial penalties.
  - With explicit SM task.
  - That is stronger with delay / repetition
  - Across variations in materials
- Imagery has no effect
  - With SM task
  - With delay / repetition
  - Even when improved ideas are imagined.



### Plagiarism on the generate new-task

- Bink et al (1999)
- Participants listened to solutions of the problems “How can the number of traffic accidents be reduced”? Told ideas came from town planners or undergraduates.
- Generate new task:
  - Student’s ideas: 8% plagiarised
  - Town planners ideas: 15% plagiarised



### Perfect & Stark (2008b)

#### Methodology

- Idea generation phase
- Idea credibility assignment
  - Excellent, Very good, Good, Satisfactory.
- Idea elaboration
  - 0, 1 or 3 improvements
- Recall-own
- Generate-new



### Credibility vs elaboration

- *Excellent ideas*: No improvements needed
- *Very good ideas*: One improvement needed
- *Good ideas*: Three improvements needed
- *Satisfactory ideas*: No improvements.
- Allocation was in fact arbitrary.

This leads to differential predictions regarding UP driven by credibility or improvement.



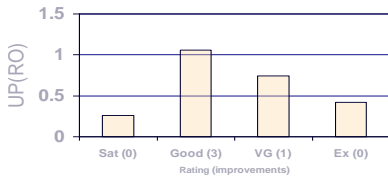
### Results – Correct Recall



- Recall driven by the amount of elaboration received by an idea.



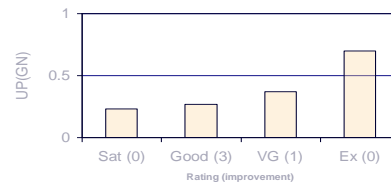
### Results – UP (Recall Own)



- UP (RO) mirrors previous findings: idea improvement increases plagiarism.



### Results – UP (Generate New)



- Generate new data does not mirror recall, or UP(RO), but is driven by idea credibility. **Not compatible with a simple strength account of GN plagiarism**



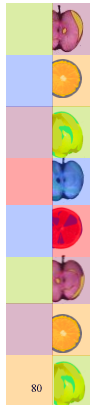
### Conclusions

- Unconscious plagiarism is a domain where the pattern of errors is not compatible with a strength-based account of memory errors.
- Different kinds of information are used to achieve different task goals.



### Overall summary

- Single-strength theory is under-attack from researchers interested in:
  - Experiential basis of memory
  - Metacognitive aspects of memory
  - Source memory
- These theories share the ideas that the experience of remembering is constructed in light of
  - Qualitative aspects of memory
  - The ongoing context.



### Context is everything

- The functional view of memory is that
  - Different memory tasks require different kinds of information
  - Different tasks / goals can create different subjective experiences of memory.
- This is profoundly important in applied areas where memory accuracy and subjective experience are both of interest.

