Max-Wertheimer Minerva Center for Cognitive Processes and Human Performance

Metacognition of Learning and Memory

The Strategic Regulation of Memory Accuracy and Informativeness

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Memory metaphors and the real-life/ laboratory controversy: Correspondence versus storehouse conceptions of memory

Abstract: The study of memory is witnessing a spirited clash between proponents of traditional laboratory research and those advocating a more naturalistic approach to the study of "real-life" or "everyday" memory. The debate has generally centered on the "what" (content), "where" (context), and "how" (methods) of memory research. In this target article, we argue that the controversy discloses a further, more fundamental breach between two underlying memory metaphors, each having distinct implications for memory theory and assessment: Whereas traditional memory research has been dominated by the *storehouse* metaphor, leading to a focus on the *number* of items remaining in store and accessible to memory, the recent wave of everyday memory research has shifted toward a *correspondence* metaphor, focusing on the *accuracy* of memory in representing past events. The correspondence metaphor calls for a research approach

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Monitoring and Control Processes in the Strategic Regulation of Memory Accuracy

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When people are allowed freedom to volunteer or withhold information, they can enhance the accuracy of their memory reports substantially relative to forced-report performance. A theoretical framework addressing the strategic regulation of memory reporting is put forward that delineates the mediating role of metamemorial monitoring and control processes. Although the enhancement of memory accuracy is generally accompanied by a reduction in memory quantity, experimental and simulation results indicate that both of these effects depend critically on (a) accuracy incentive

Eyewitness memory

Trying:

"To Tell the Whole Truth and Nothing but the Truth"

A “real-life” example

Q: *Please tell us what you saw as you were getting out of your car.*

A: I had just opened the door when I heard someone scream. As I looked up, a man in a dark sweatsuit burst through the gate of the yard and ran full speed down the alley. I think he was carrying a bag or something.

Q: *This bag – what color was it?*

A: Umm… I'm not sure.

Q: *Could you take a guess?*

A: No.

Q: *Do you remember what time it was?*

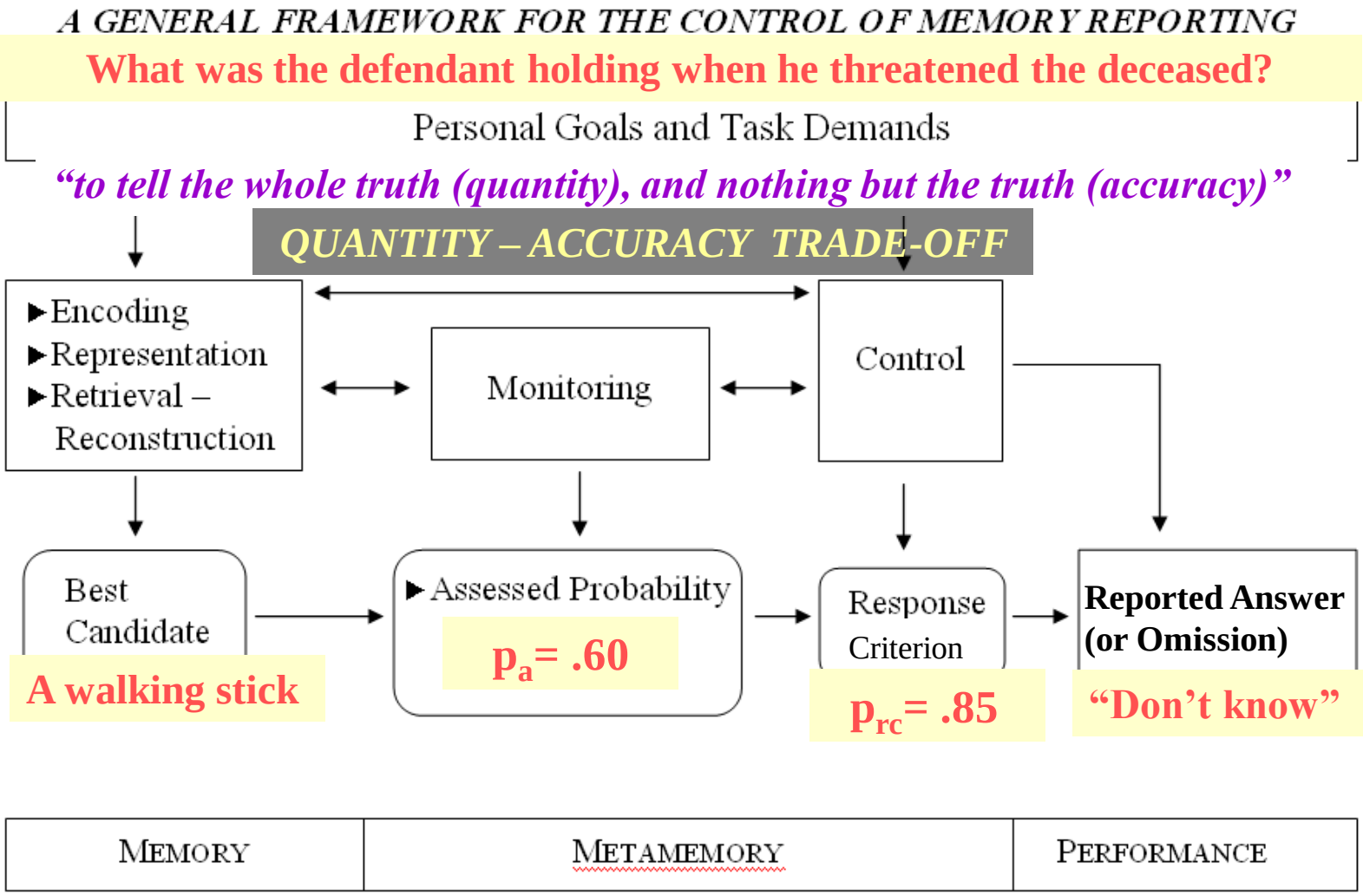
A: Around 6 o'clock, maybe 6:30.

Q: *Can you be more specific?*

A: Umm… I’d say between 6:15 and 6:30.

Two Types of Report Control

- **Report Option** – Withholding particular items of information (responding "don't know" or "don't remember") in order to *screen out wrong answers*.
- **Grain Size** – choosing a level of coarseness or generality at which the answer is *unlikely to be wrong*.



Koriat and Goldsmith (1996)

Retrieval ==> Monitoring ==> Control ==> Performance

- **Retrieval ("memory"):**

  the amount and quality of the information that can be retrieved.

- **Monitoring effectiveness:** **(confidence ⇔ correctness)**

  the extent to which the assessed probabilities successfully differentiate correct from incorrect candidate answers.

- **Report criterion setting:**

  the confidence threshold, above which retrieved information is reported, below which it is withheld.

- **Control sensitivity:** **(confidence ⇔ volunteering)**

  the extent to which the volunteering or withholding of answers is in fact based on the monitoring output.

QAP Assessment Methodology

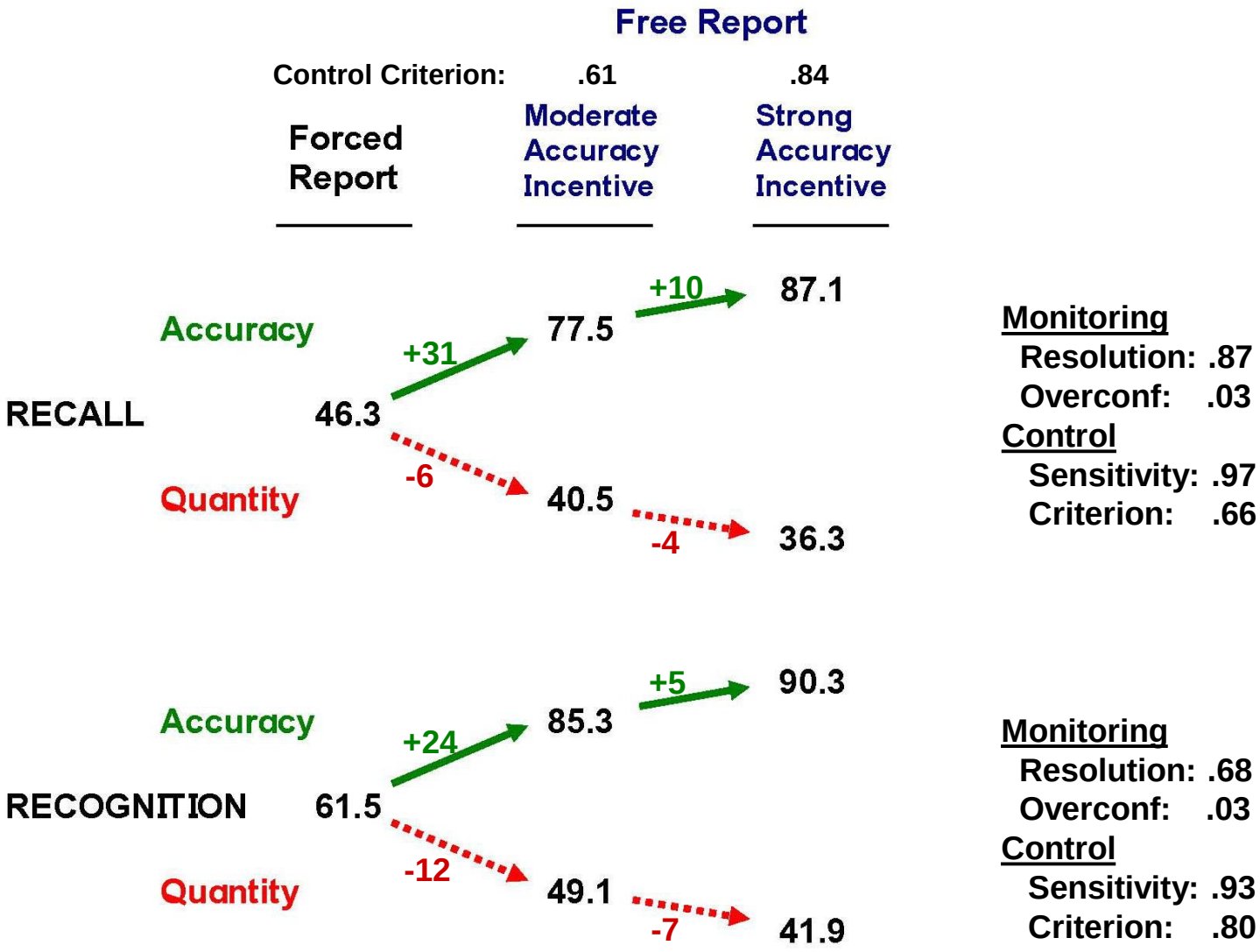
- **A set of memory questions or cues**
- **For each item:**
  - **Forced report answer**
  - **Confidence rating** (subjective probability correct)
  - **Free report decision – volunteer or withhold**
    - Accuracy Incentive: +1 for correct answers
      –1 for wrong answers
      0 for withheld answers

QAP Assessment Methodology

TAPS:

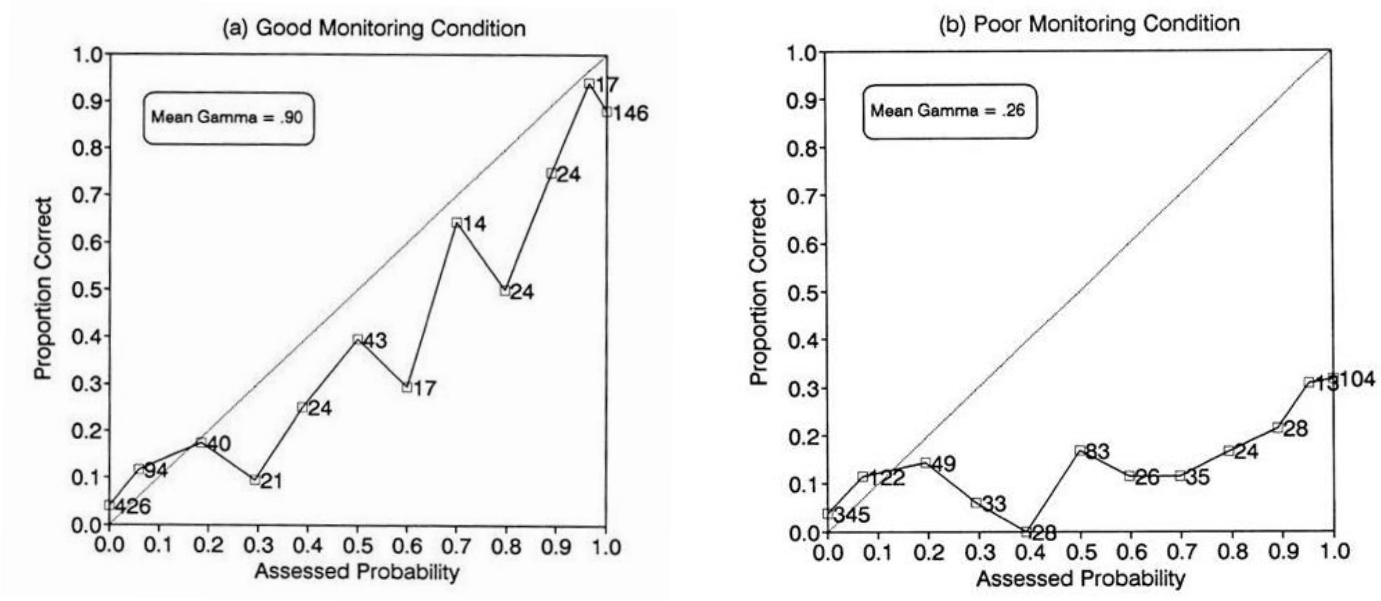
- **RETRIEVAL** (forced-report % correct)
- **MONITORING** (confidence ⇔ correctness)
- **CONTROL** (confidence ⇔ volunteering)
- **PERFORMANCE** (free-report)
  - Quantity - % of questions answered correctly.
  - Accuracy - % of answers that are correct.

Koriat and Goldsmith (1996, Experiment 1)

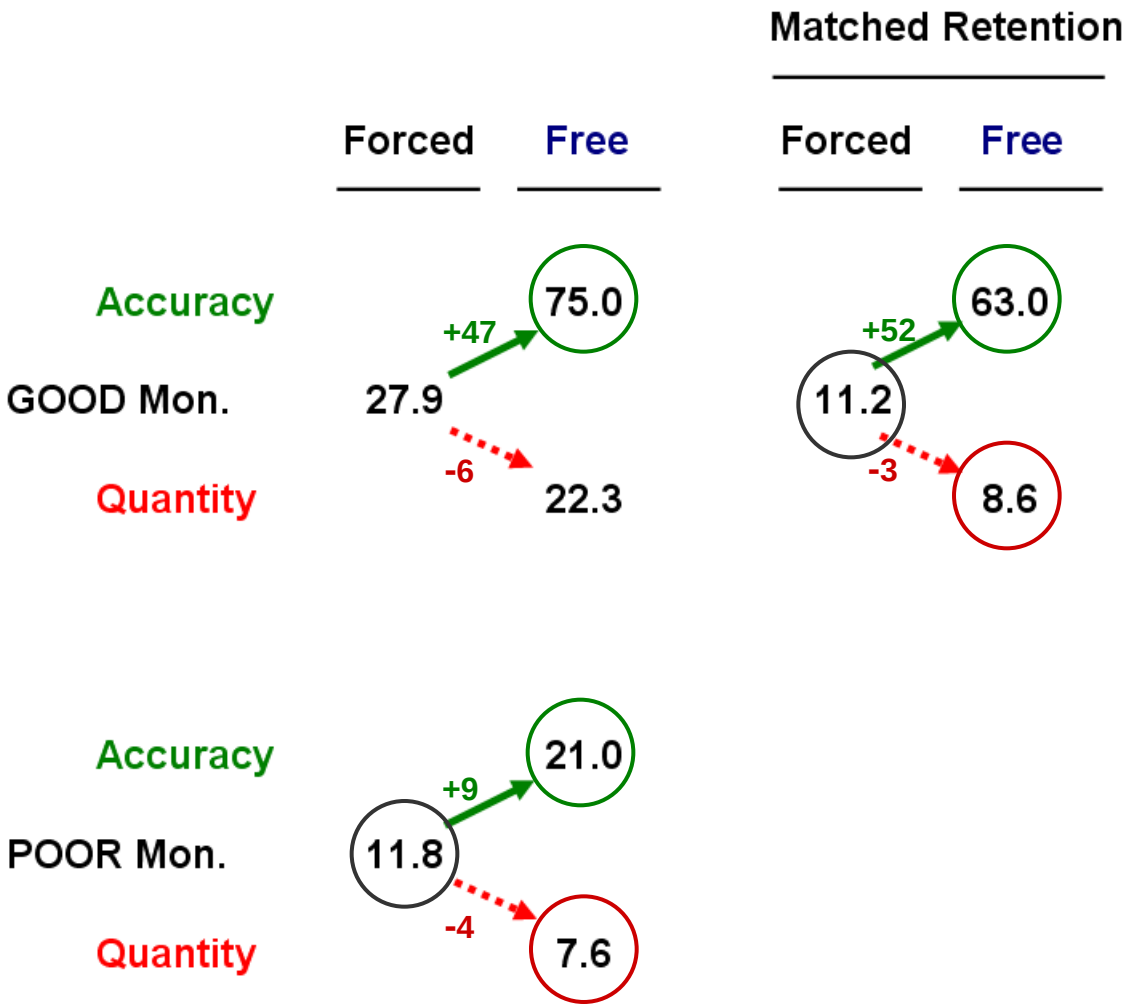


Koriat and Goldsmith (1996, Experiment 1)

Contribution of Monitoring



Koriat and Goldsmith (1996, Experiment 2). Calibration curves for standard and deceptive items.



Koriat and Goldsmith (1996, Experiment 2).

Applications

- Eyewitness memory *(e.g., Evans & Fisher, 2010 ; Weber & Perfect, 2012)*
- Children's memory *(e.g., Koriat et al., 2001; Roebers & Schneider, 2002, 2005)*
- Aging *(e.g., Kelley & Sahakyan, 2003; Pansky et al., 2009; Rhodes & Kelley, 2005)*
- Clinical populations *(e.g., Ben-Shachar et al., 2013; Danion et al., 2001; Koren et al., 2006)*
- Psychometric testing *(e.g., Higham, 2006; Higham & Arnold, 2007; Notea-Koren, 2005)*
- Accuracy over time *(e.g., Goldsmith et al., 2005; Evans & Fisher, 2010)*
- Encoding specificity *(e.g., Higham, 2002; Higham & Tam, 2005)*

Control over Grain Size

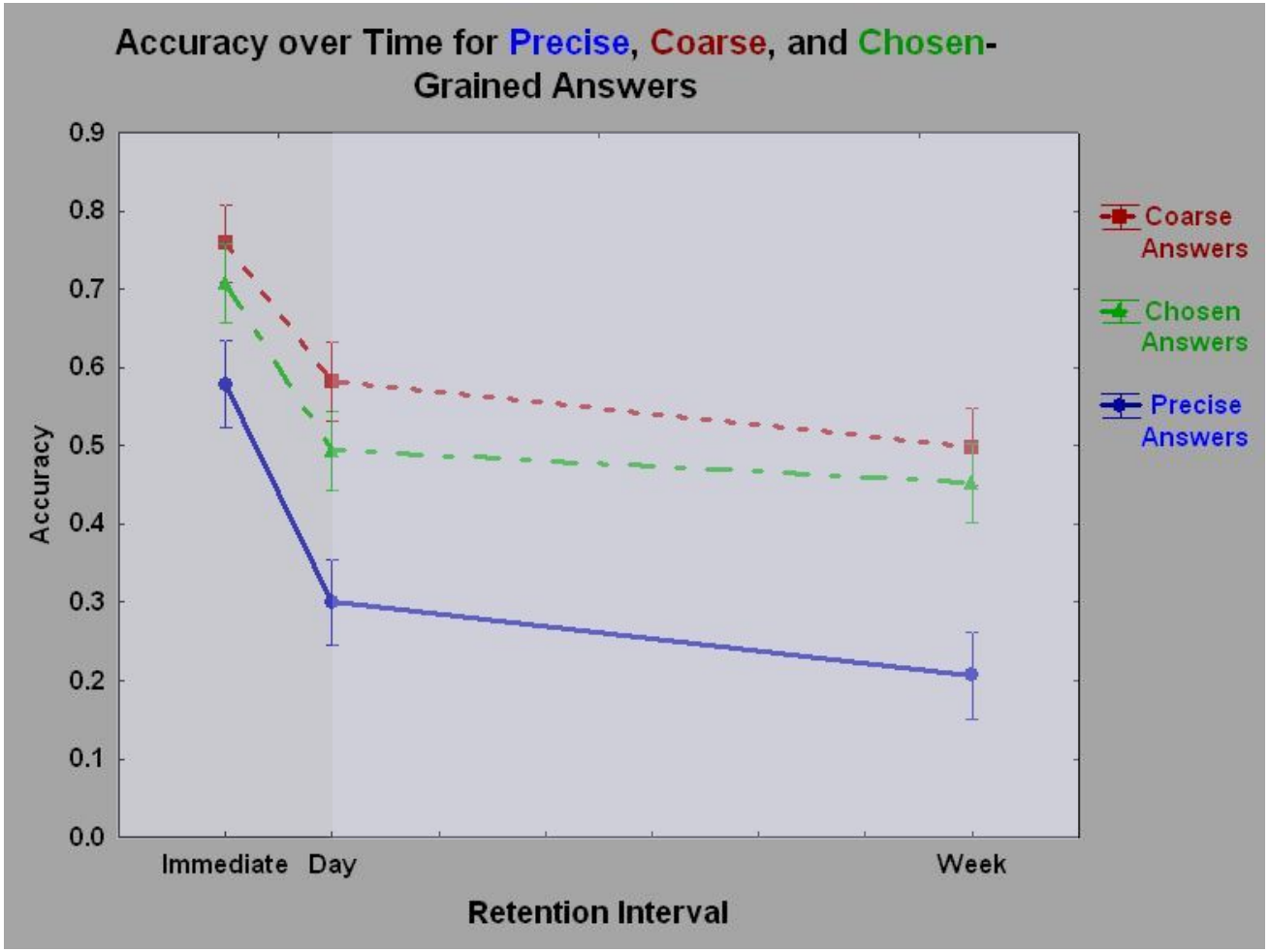
What time did the incident occur?

6:20	**guess**
6:15 – 6:30	**probably**
6:00 – 7:00	**highly likely**
"Sometime in the early evening ..."	**definitely**

ACCURACY - INFORMATIVENESS TRADE-OFF

Goldsmith et al. (2002, 2005)

Strategic Regulation of Memory Grain Size over Time



Goldsmith, Koriat, & Pansky (2005, JML special issue on Metamemory)

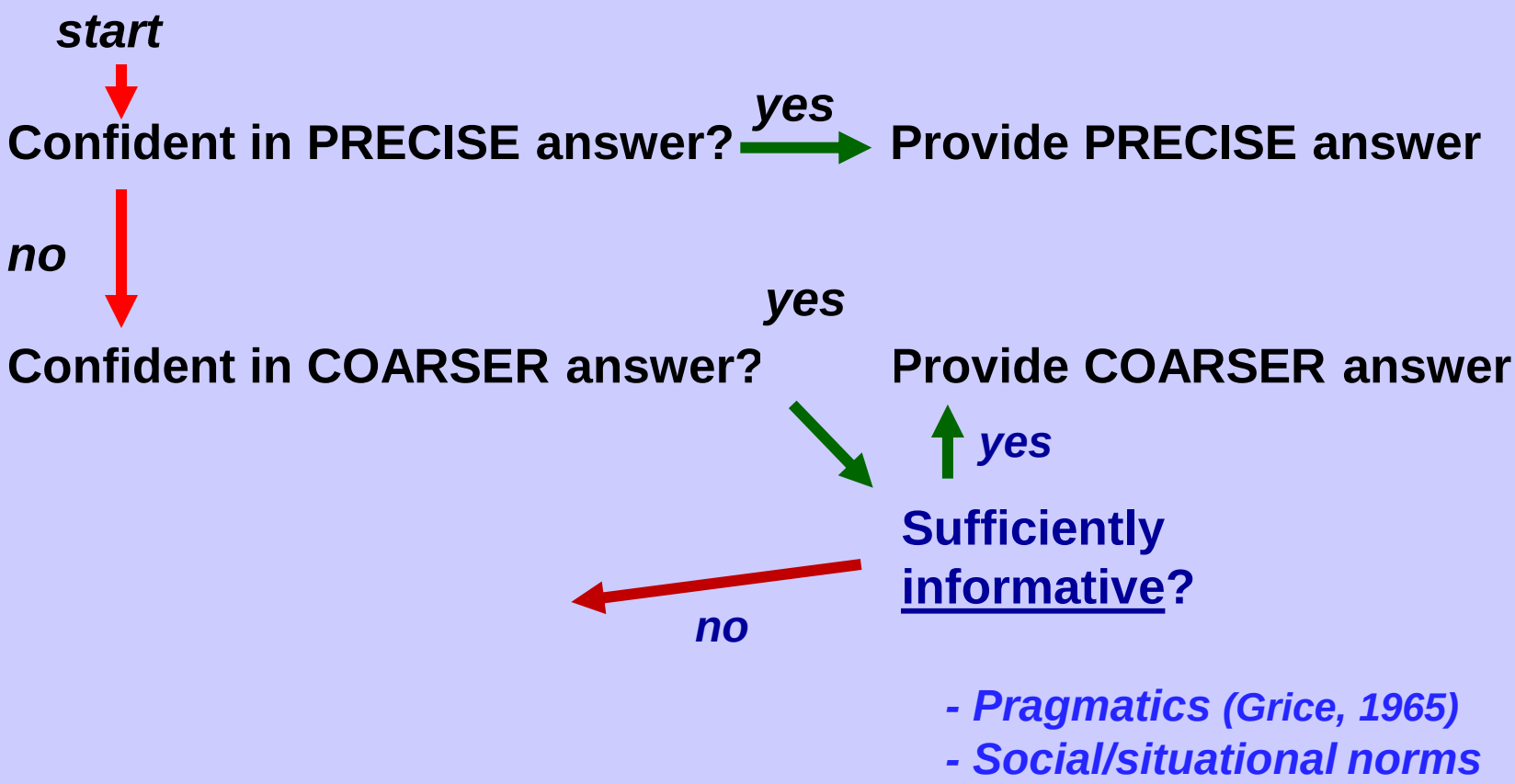
Control of Grain Size and Report Option

- **Both involve an accuracy – informativeness trade-off.**
- **Both involve monitoring the correctness of candidate answers.**
- **Both involve setting a report criterion per competing incentives for accuracy and informativeness.**

➢ **A single integrated model?**

Ackerman and Goldsmith (2008)

Control of Grain Size and Report Option



Ackerman and Goldsmith (2008)

Interim Conclusions

- Report option and grain size are both important means of regulating accuracy and informativeness of memory reports.
- We must understand such regulation in order to understand the factors underlying memory performance in real-life settings.
- Doing so requires examination of cognitive, metacognitive, and social-pragmatic contributions to memory performance.

Metacognitively Guided Retrieval and Report (META-RAR): Quality Control Processes in Recall

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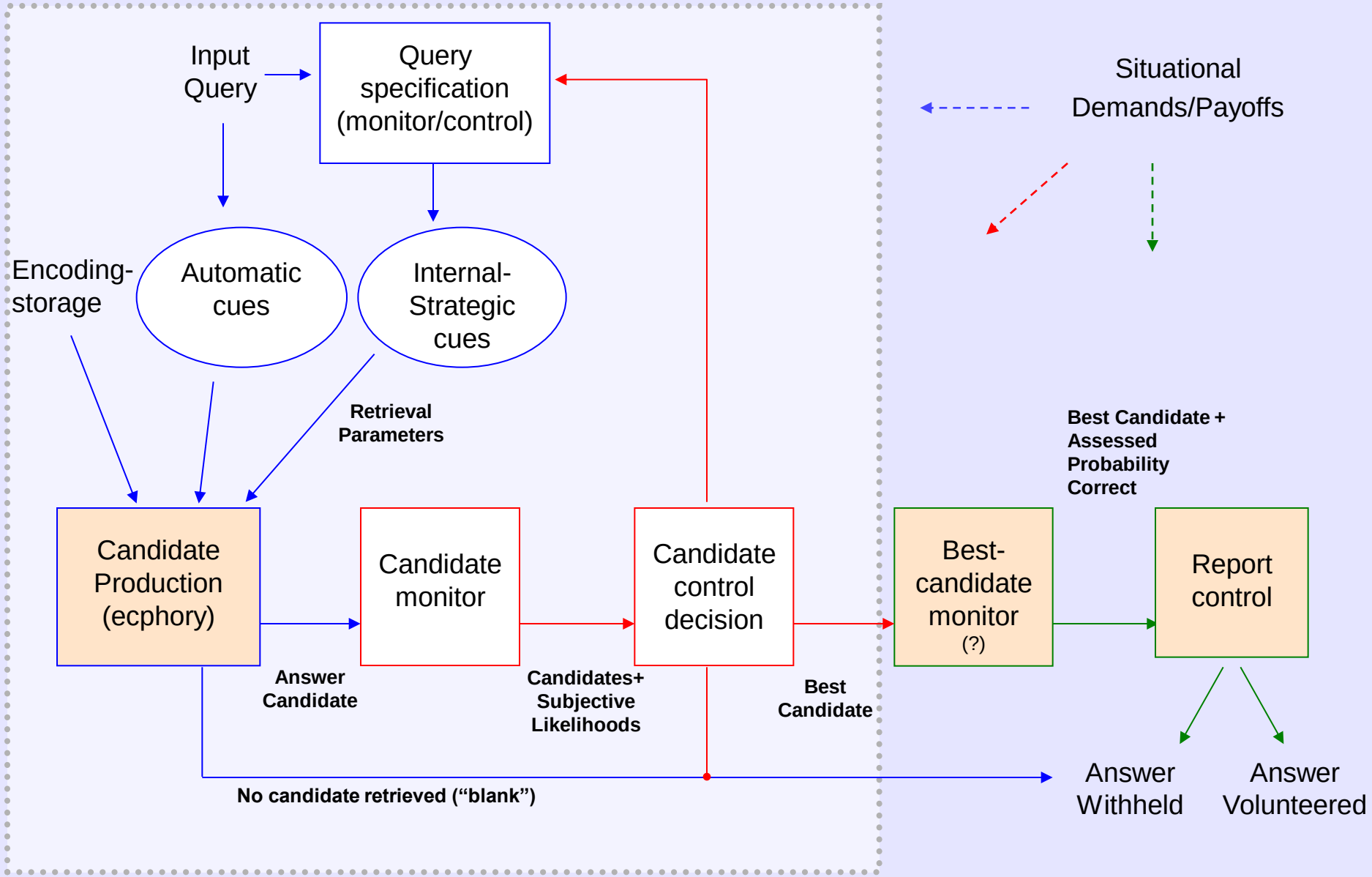
RATIONALE

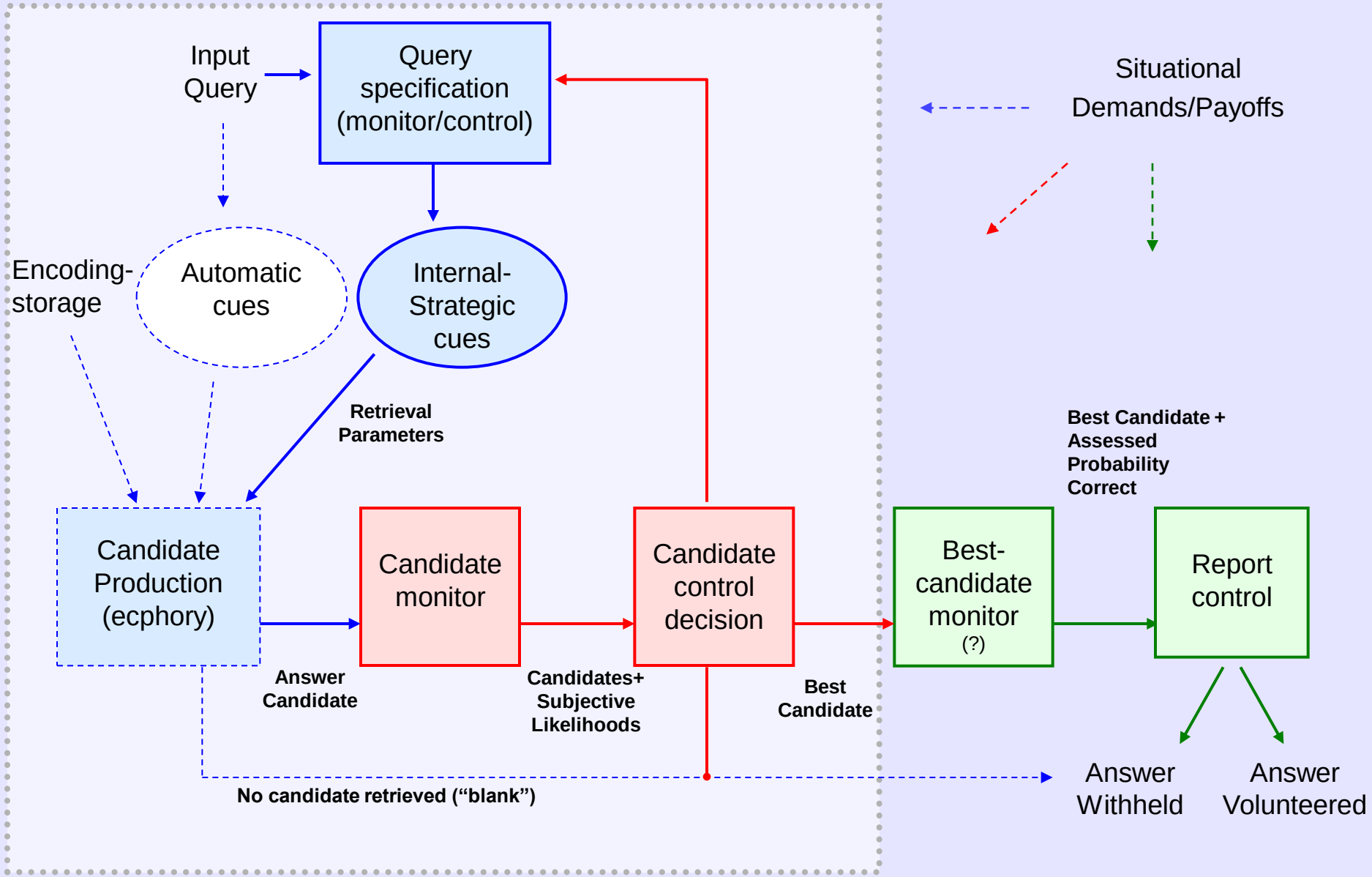
Quality control in manufacturing involves:

- **post-production monitoring and control processes that identify and screen out defective products.** ***[back-end]***
- **improved production techniques, so that fewer defective products are produced in the first place.** ***[front-end]***

META-RAR FRAMEWORK



META-RAR FRAMEWORK



RAR-QAP METHODOLOGY

Cue Word	Produced Candidates	Confidence	Report Decision
TABLE	C H A I R C H O I R C H E E R	40 %	YES / NO
LIGHT	S K I R T S _ _ _ _ S _ _ _ _	100 %	YES / NO
LOCK	T I M E R T U N E R T _ _ E R	80 %	YES / NO

RAR-QAP METHODOLOGY

Cue Word	Produced Candidates	Confidence	Report Decision
TABLE	CHAIR CHOIR CHEER	40 %	YES / NO
LIGHT	SKIRT S____ S____	100%	YES / NO
LOCK	TIMER TUNER T__ER	80 %	YES / NO

MEASURES:

- ➢ **Production quality**
- ➢ **Candidate monitoring**
- ➢ **Best-candidate monitoring**
- ➢ **Report control**
- ➢ **Free-report performance**
  (accuracy and quantity)

FRONT-END CONTROL

Source constrained recall (Halamish, Goldsmith & Jacoby, 2012)

- Self-initiated use of source information to constrain what comes to mind during retrieval.
- Example: mental reinstatement of encoding operations.

Choice of retrieval strategy (Halamish, Goldsmith & Jacoby, in prep.)

- Direct retrieval vs. Generate-Recognize strategy.
- Example: choose direct retrieval when cue-target association is weak; G-R when association is strong.

Future Plans

- **META-RAR framework:**
  - Other types of front-end control
  - The “retrieval loop” component
  - Interactions between front-end and back-end processes
  - Applications (e.g., children, aging, confabulators)
  - Front-end vs. back-end control of memory grain size
- **Other issues:**
  - Conscious vs. unconscious influences