Constructive retrieval by prompted recall

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Retrieval practice in research

- Effectiveness of retrieval practice

  (e.g. Chan, 2010; Rowland, 2015)

  - Retrieval can strengthen new learned material
  - Better long term memory after initial recall
  - Never recalled material

How can we push learning by retrieval?

Efficiency factors

- Retrieval helps remembering, when
  - retrieval for learning is successful (e.g. Carpenter, 2015)
  - retrieval is mentally effortful (e.g. Endres & Renkl, 2015)

Problem for pushing

- Using more demanding tasks
- Retrieval tasks are different for learners

⇦Lowering retrieval success for some learners

Constructive retrieval hypothesis

Hinze, Wiley, and Pellegrino (2013)

- Constructive retrieval enhances comprehension
  - Combining retrieval and constructive forms of learning

⇨ No need for difficult tasks
⇨ Even good learners can invest all effort they have

Better comprehension after combined tasks

The idea

- Testing in free recalls similar to learning protocols
  - Prompt enriched learning protocols

    (Berthold, Nückles & Renkl, 2007; Nückles, Nückles, Hübner & Renkl, 2009)
  - After study activity
  - Enrichment enhances learning

Prompt enriched free recall

Hypotheses

Strategy Hypothesis

Prompted recall condition increases use of elaborative strategies in initial recall

Learning-Outcomes Hypothesis

Prompted recall can enhance comprehension of the learning contents

Mediation Hypothesis

Expected effect on comprehension is mediated by the elaboration strategies employed during initial recall

Methods

Participants & Design

- Fifty-six undergraduate students

  age: *M* = 23.16, *SD* = 3.42

- Between subject design

- 3 Phases
  - Learning phase (video presentation)
  - Intervention phase (Free - or Prompted Recall)
  - Assessment phase (posttest on learning outcomes)

Learning phase

- 30-minute video-recorded lecture
  - Similar to real student learning
- Cognitive load theory
  - Comprehension orientated learning material

Intervention phase

Free recall

"Please, write down all contents you can remember from the just seen video presentation."

Prompted recall

"Please refer to examples from your own life, which illustrate the learning material, are consistent with it, or stand in conflict with it."

- Mental effort raiting
- Coding of used learning strategies (Glogger et al., 2012)

Assesment phase

- One week delay
- Learning outcome
  - Fact Learning
    - Lecture contains all answers to the questions
  - Comprehension
    - Deeper understanding is neccesary

Results

Strategy hypothesis

- Use of elaborative strategies

  t (31.86) = 6.27, p < .001, d = 1.62

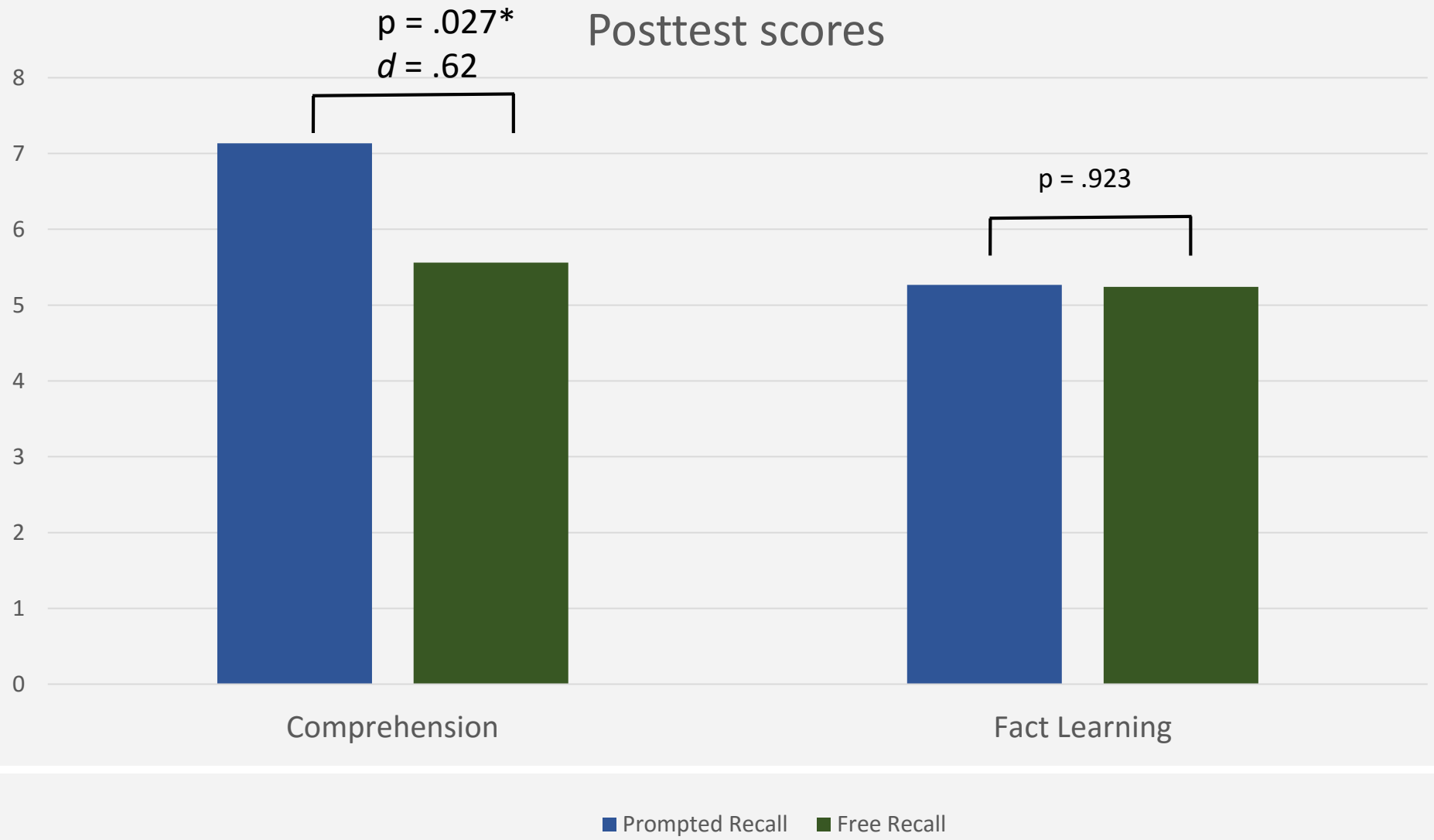
- Any uses of elaborative strategies

Free recall group	5 of 25
Prompted recall group	26 of 30

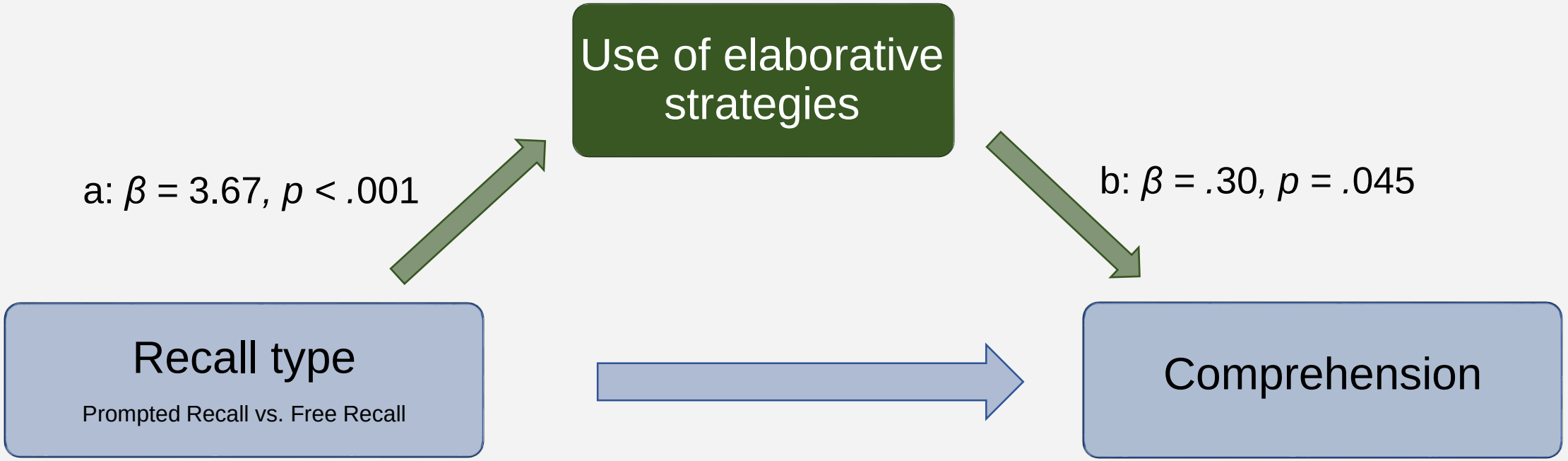
Other factors

- Time on task
  - Longer for prompted recall group
    - t (51.13) = 2.99, p = .004, d = 0.80
- Number of words
  - Longer responses from prompted recall group
    - t (48.73) = 2.36, p = .022, d = 0.63
- Mental effort
  - No group differences
    - t (53) = 0.097, p = .923

Learning Hypothesis

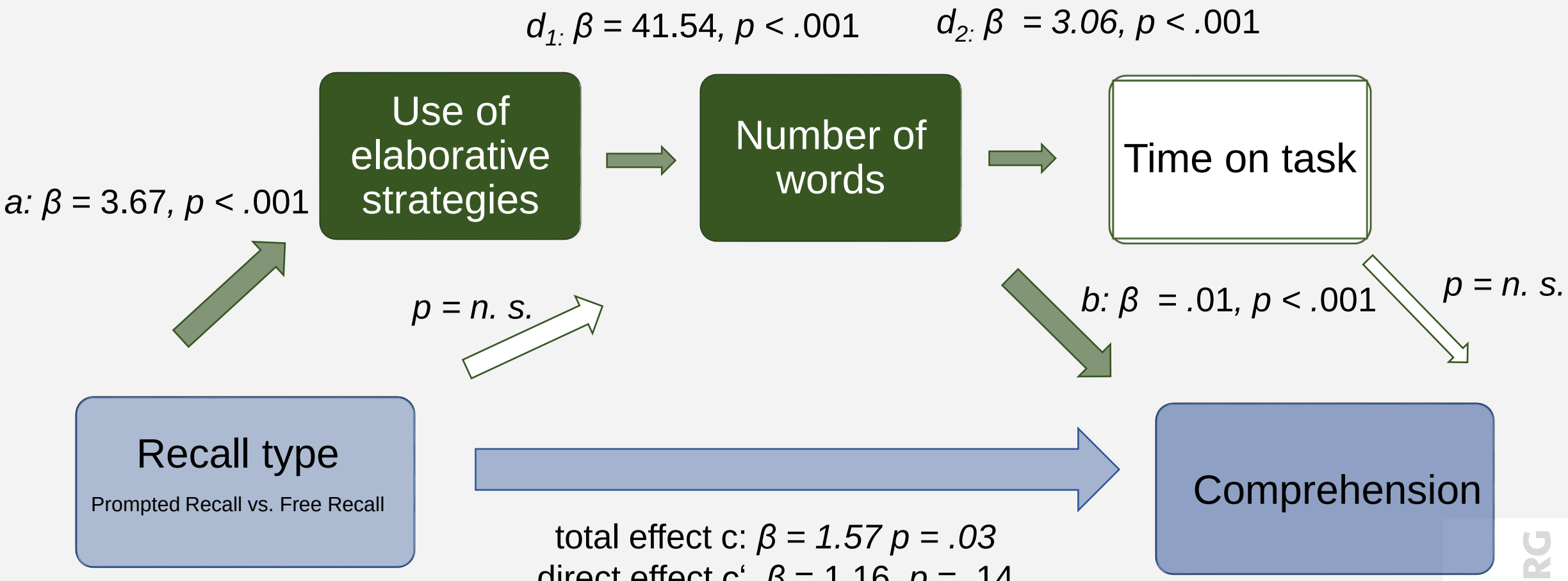


Mediation Hypothesis



total effect c: $\beta = 1.57$ $p = .03$
direct effect, c‘: $\beta = 0.48$, $p = .58$
indirect effect, 1.10, 95% CI [0.18, 2.20]
completely standardized indirect effects .21, CI [.0313, .4286]

Mediation Hypothesis



total effect c: β = *1.57* p = *.03*
direct effect c‘, β = 1.16, p = .14
indirect effect, 1.64, 95% CI [0.67, 2.72]
completely standardized indirect effects .31, CI [0.14, 0.52]

Discussion

Hypotheses

Strategy Hypothesis

Strategy use

Learning-Outcomes Hypothesis

Enhanced comprehension

Mediation Hypothesis

Mediated by the elaboration strategies

Further Discussions

- Constructive retrival can enhance comprehension
  - No rise of mental effort
  - Less risk of no retrivall
- No effective enhancement of fact learning
  - Only when comprehension is relevant

Further studies

- Add a passive control group
- Control for time-on-task and number of words
- Try to use other prompts from learning protocol literature

Thank you for your attention !

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Multiple regression

- Elaborative word predict
  - Comprehensive

    $\beta = .38, t(52) = 2.50 , p < .016$

  - Not Fact Learning

    $\beta = .05, t(52) = -0.31, p = .754$

		Free Recall	Prompted Recall
Intervention task	Idea units	4.96 (1.54)	4.27 (1.80)
	Number of words	252.40 (103.87)	341.23 (171.59)
	Time in min.	15.96 (6.97)	22.94 (10.24)
	Metacognition	0.20 (0.50)	0.27 (0.58)
	Organization	1.90 (0.50)	1.88 (0.66)
	Elaboration	0.36 (0.64)	4.03 (3.13)
Posttest	Facts	5.24 (3.56)	5.26 (3.36)
	Comprehension	5.56 (2.57)	7.13 (2.55)