Concerns with dual-system approaches to cognition

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COVIS

COmpetition between Verbal and Implicit Systems

Dual-system model:

- Explicit system - uses working memory to test hypotheses
- Implicit system - gradually associates stimuli with responses

COVIS has been extremely influential:

- Popular in terms of citations
- Inspired a lot of work on interesting questions
- Found several examples of the counter-intuitive findings that are usually cited in support of dual-system accounts

Does that mean that category learning is mediated by two competing systems?

The important factor here is the **quality** of the evidence, not the quantity.

What constitutes quality evidence for a theory?

Two main points:

- Are there any obvious confounds?
- Can the findings be replicated?

I'm going to look at two threads of research that demonstrate that, for COVIS, these criteria aren't as easy to meet as you might expect.

Experiment summaries

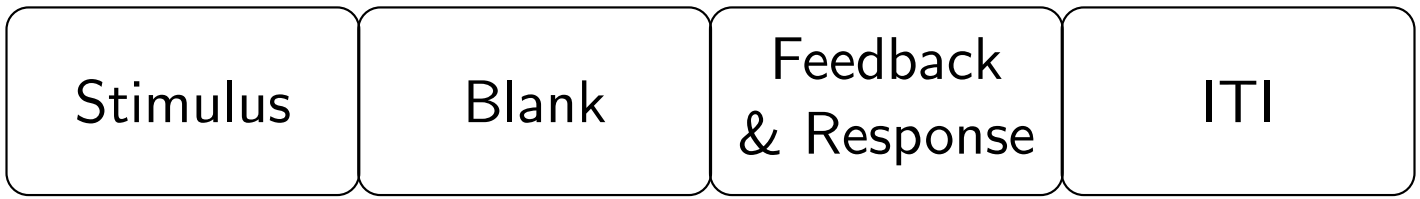
We looked at two studies that have been cited in support of COVIS:

1. Looked at role of feedback type
2. Looked at the role of training order

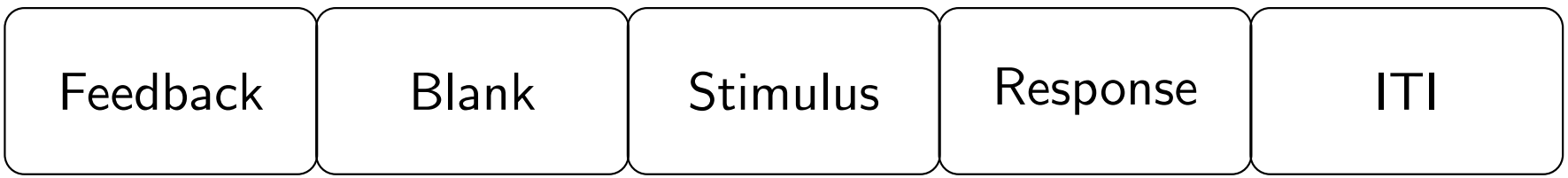
Ashby, Maddox and Bohil (2002)

The role of feedback type

This experiment compared feedback training:

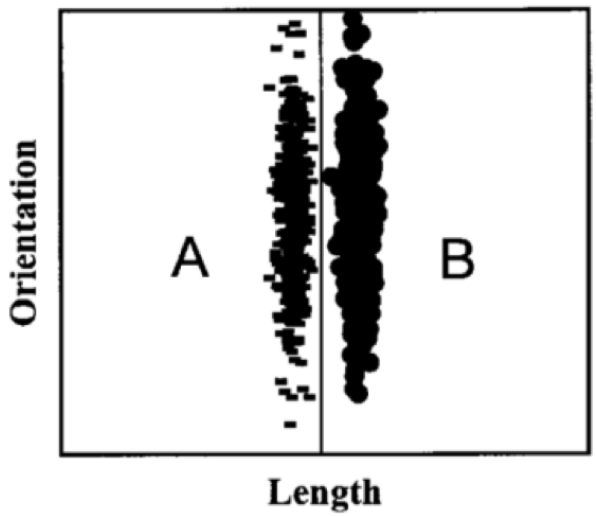


with observation training:

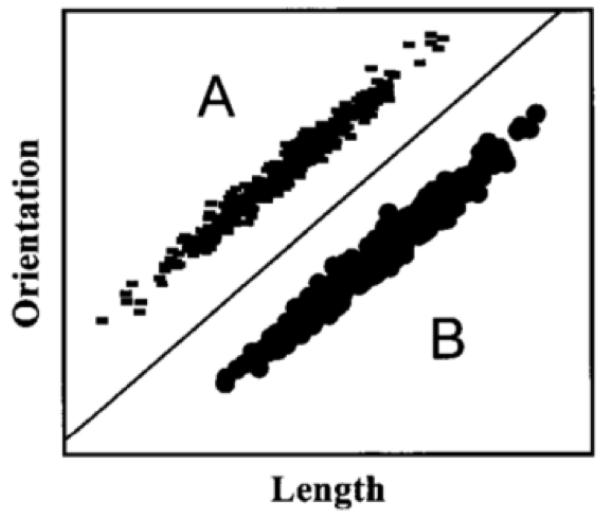


Ashby, Maddox and Bohil (2002)

Category structures



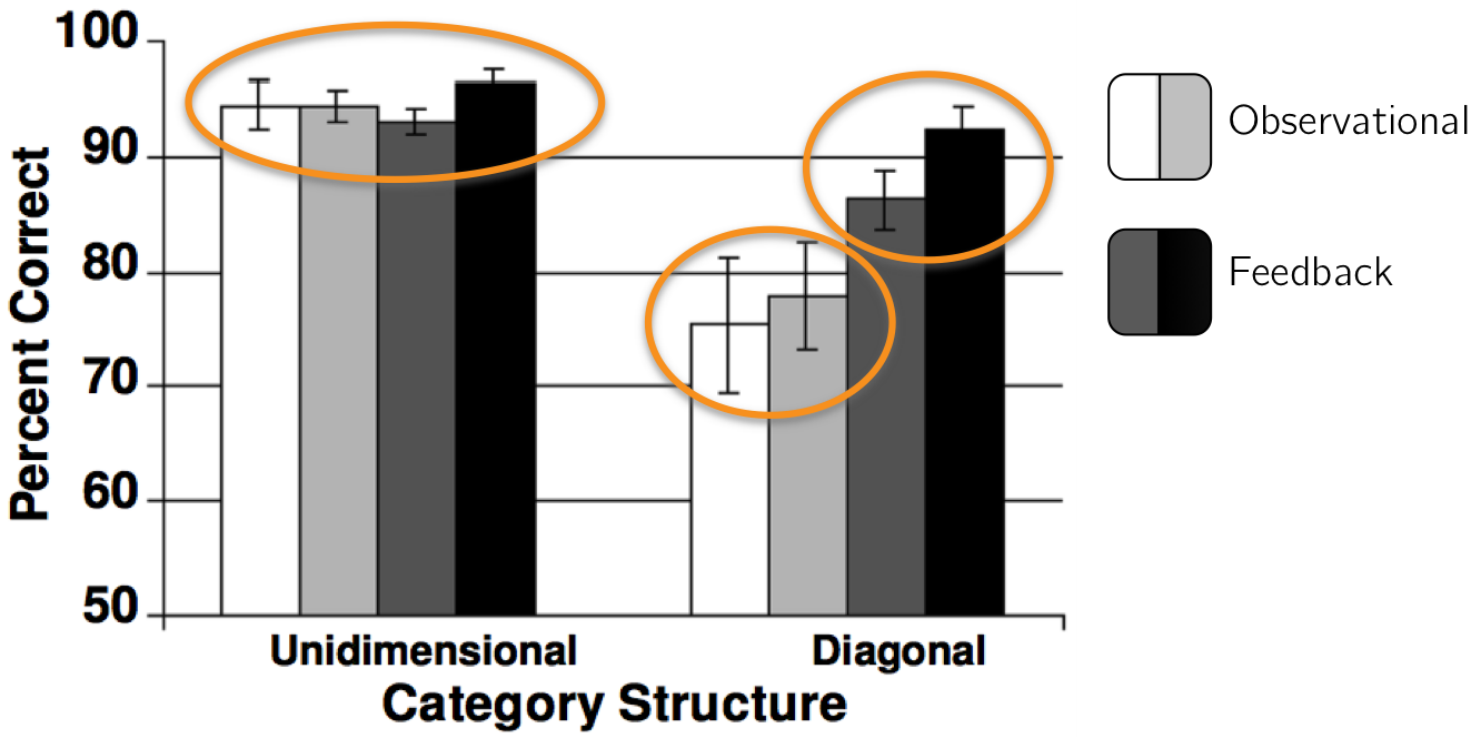
Unidimensional rule-based category structure



Information-integration category structure

Ashby, Maddox and Bohil (2002)

Results



Experiment 1

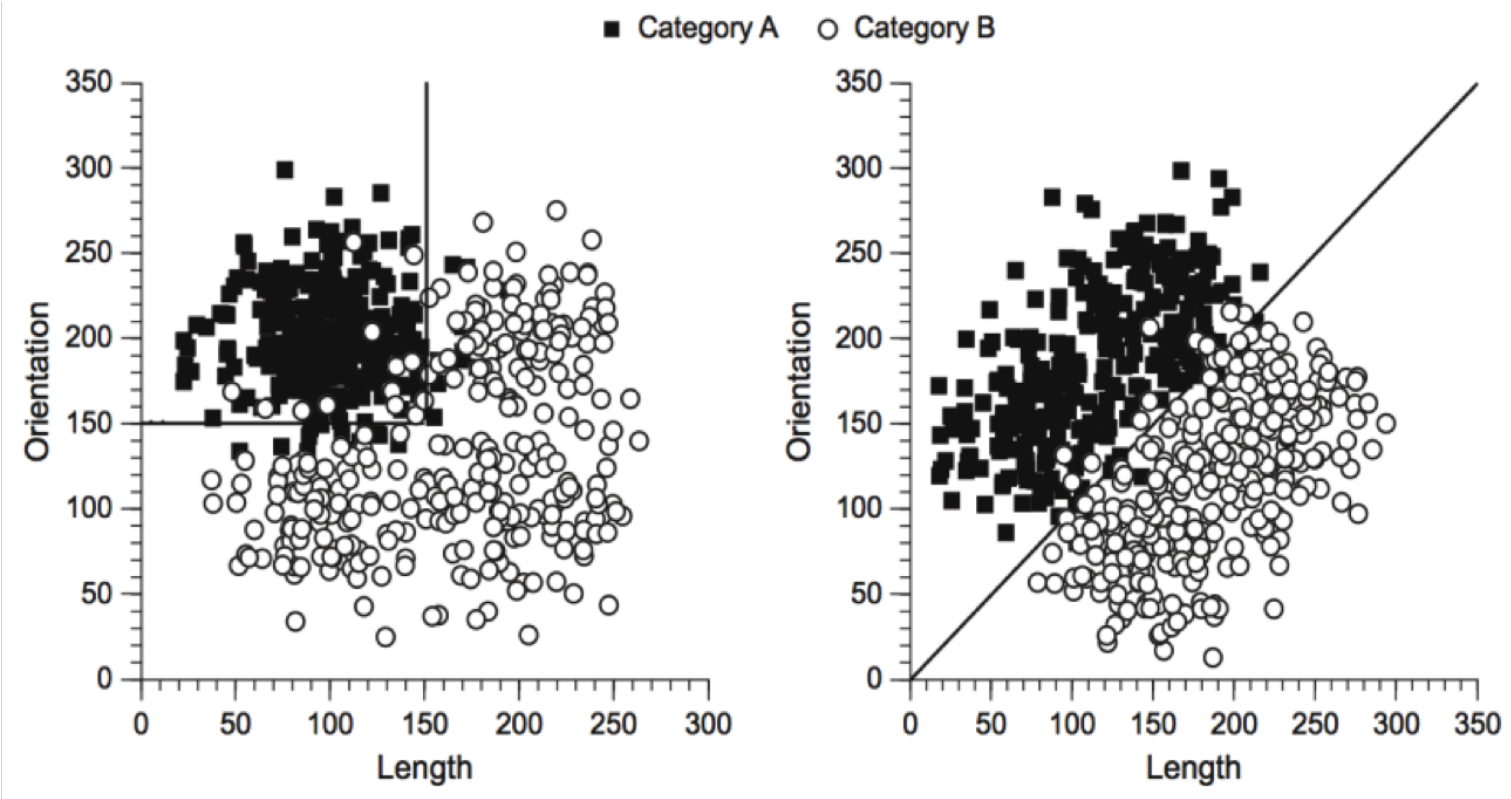
The study above had some confounds:

- Category structures were not matched for number of relevant dimensions
- Trial timing not quite matched

Overall, these two things also result in mismatched errors between the two category structures.

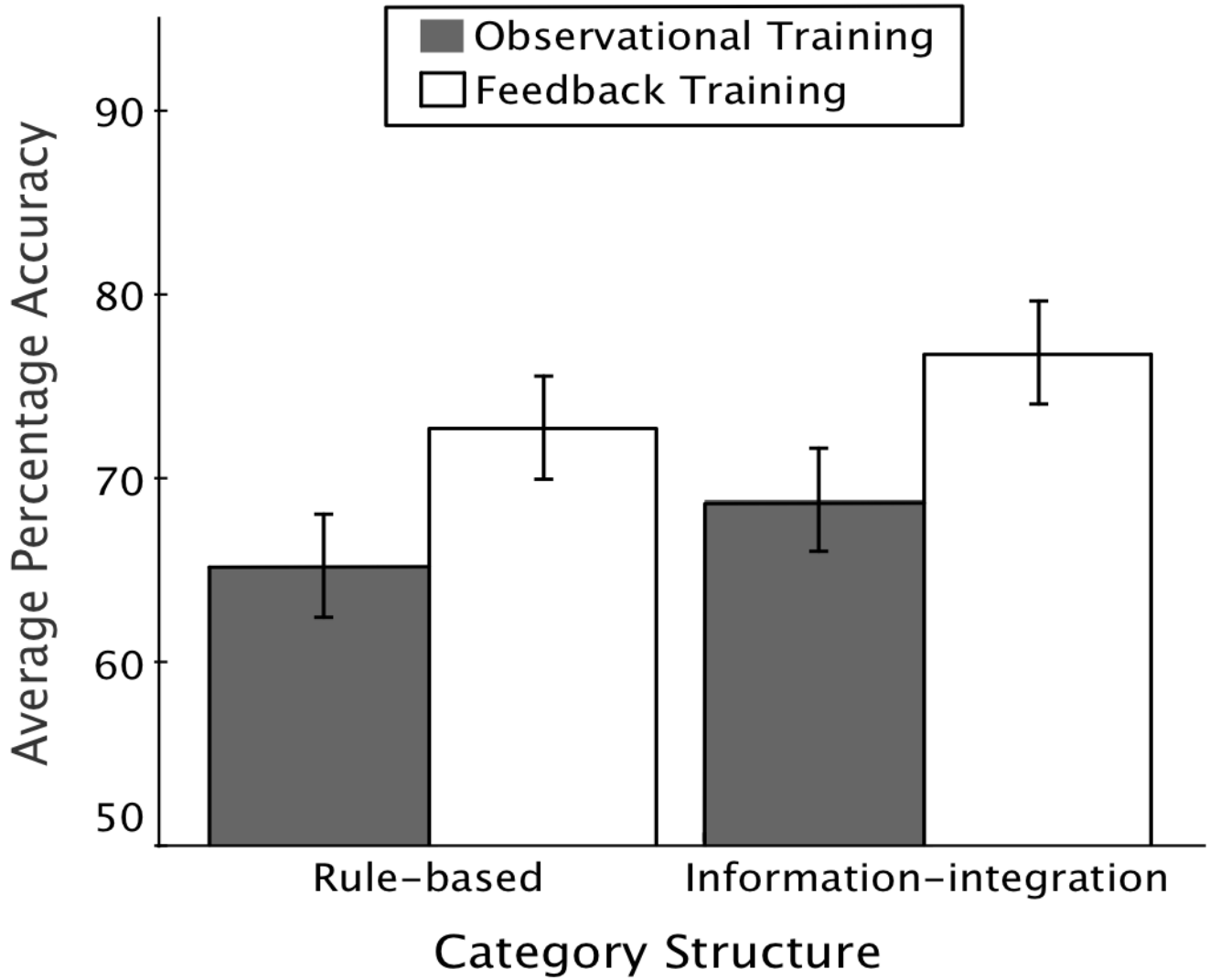
Experiment 1*

Category structures



Experiment 1†

Results



Experiment 1

Summary

All-in-all:

- Replicated difference in training types for information-integration category
- **BUT** this difference is the same for rule-based categories too

So, in this case, once you remove the confounds, the dissociation disappears.

Spiering and Ashby (2008)

The effect of training order

This experiment compared easy-to-hard training:

Block 1: Easy stimuli	Block 2: Med stimuli	Block 3: Hard stimuli	Test: All stimuli

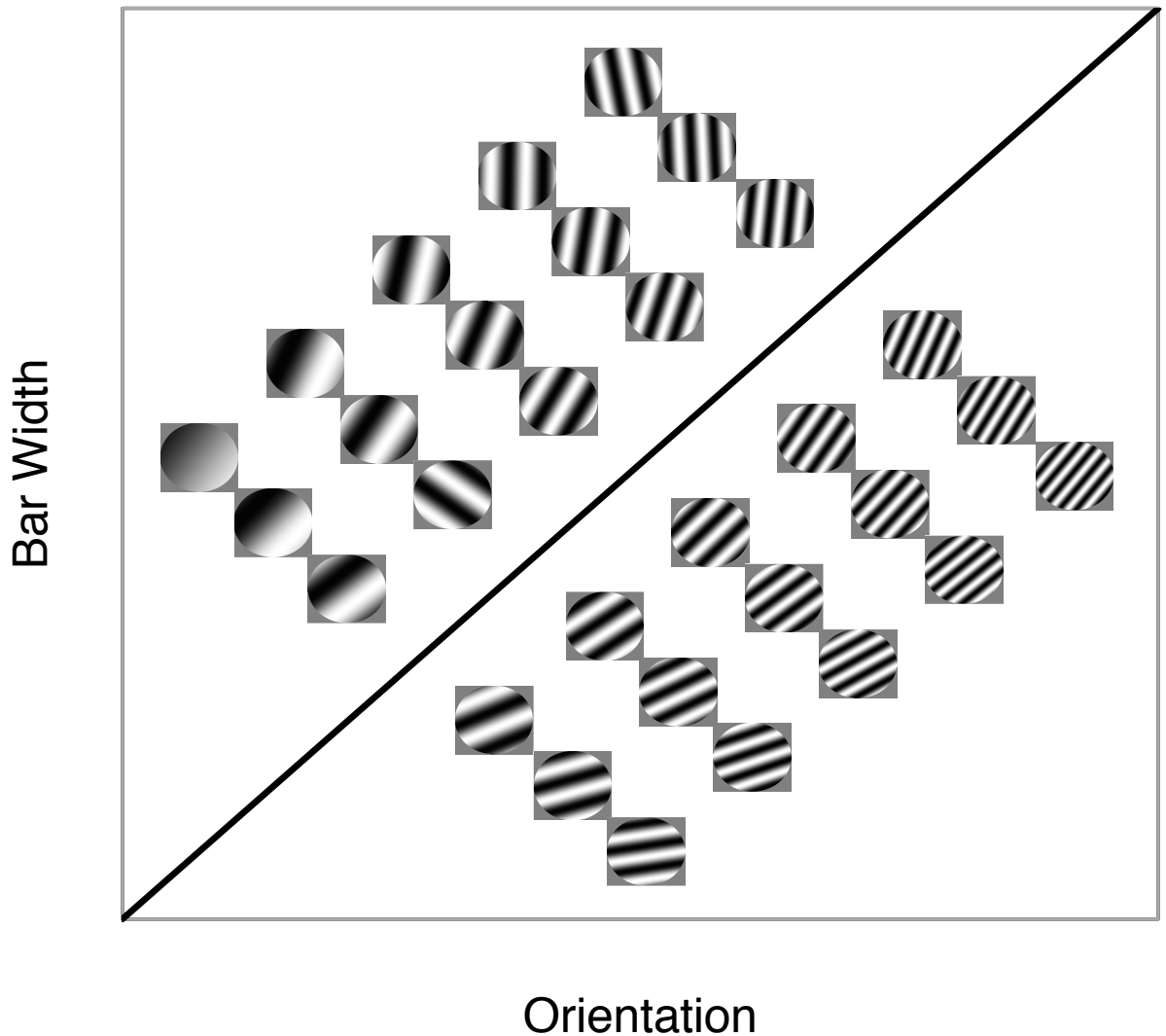
with hard-to-easy training:

Block 1: Easy stimuli	Block 2: Med stimuli	Block 3: Hard stimuli	Test: All stimuli

when learning an information-integration category.

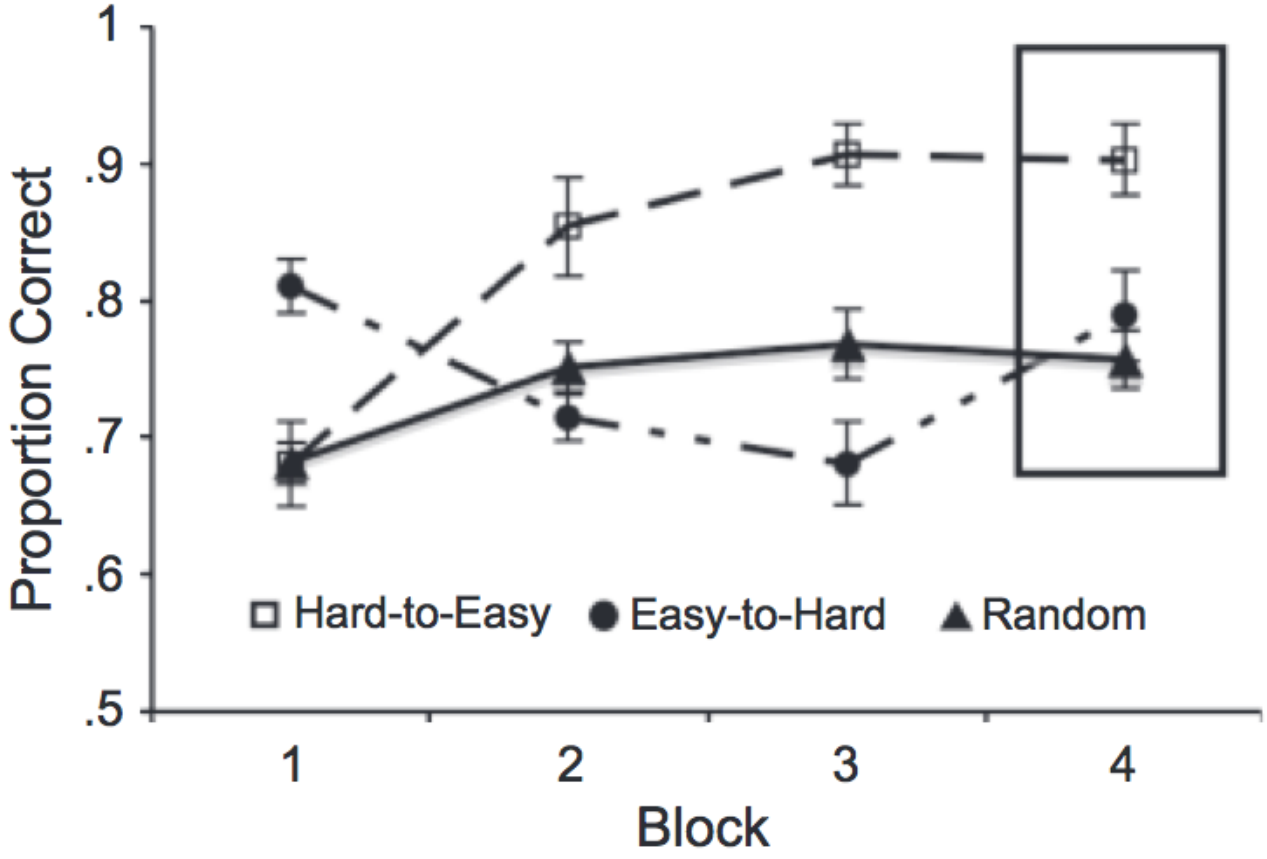
Spiering and Ashby (2008)

Category structure



Spiering and Ashby (2008)

Results



Experiment 2

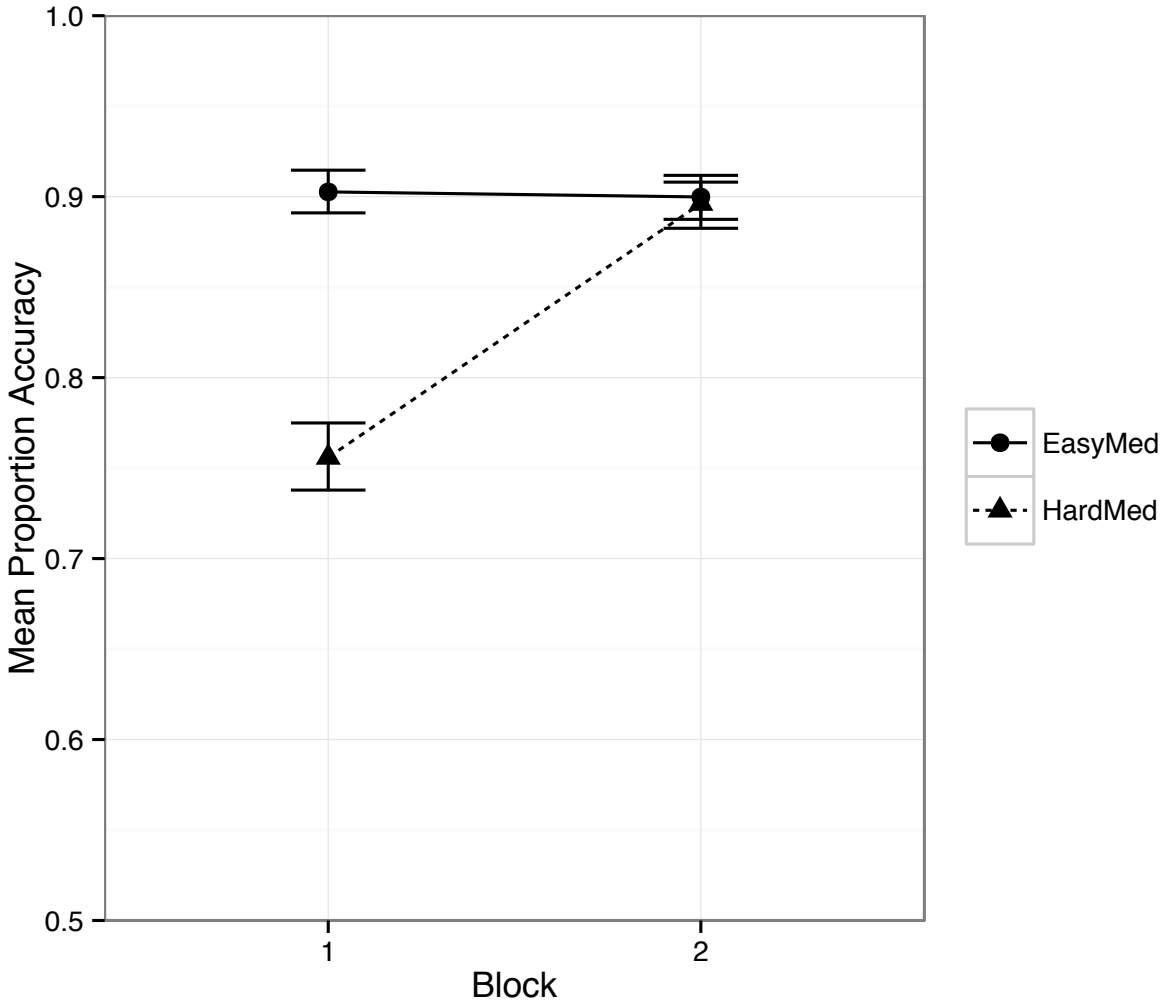
Identical to Spiering and Ashby (2008) apart from one thing:

- Only replicated the first two blocks

Experiment 2

Results

No effect of training type on final block performance



Experiment 2

Summary

We failed to replicate Spiering and Ashby (2008) multiple times

1. Straight "replication "
2. Using line stimuli and visual feedback (rather than auditory feedback)
3. Using line stimuli, visual stimuli and a 350ms presentation time (rather than 1,000ms)

The results for all of these experiments, looked the same as before. We could find no difference on final performance when varying the type of training beforehand

What conclusions can we draw?

- These two experiments cannot be used to support COVIS
- However, even one experiment that robustly supported a dual-system would be persuasive

The questions that the experiments I've talked about were designed to above are still interesting:

- What effect DOES errorless training have on learning?
- What happens if your training is easier but can also be solved by a simpler, non-optimum solution?

Ideal approach combines both fascinating research questions and stringent research methods.

Thank you very much for your attention.