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The Reliability and Structure of Metacognitive Skills and their Relationship to Cognitive Performance

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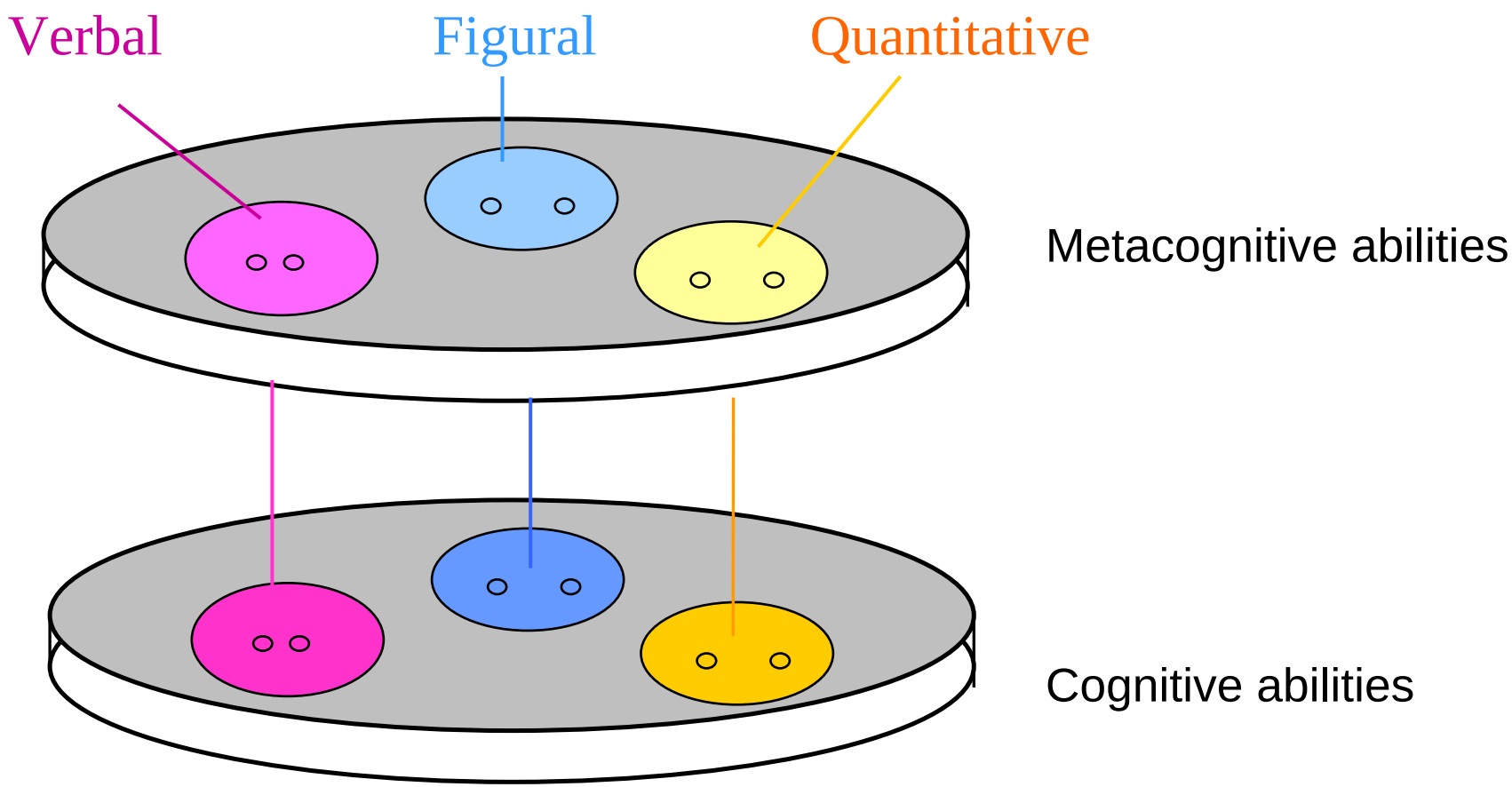
The study has 3 goals:

1. To examine whether individual differences in metacognitive accuracy are reliable.

2. To examine the structure of metacognitive abilities.

3. To explore the relationship between cognitive and metacognitive abilities.

A structural framework for metacognitive and cognitive abilities:



The tests included in the battery:

Verbal
1. Analogies
2. Vocabulary

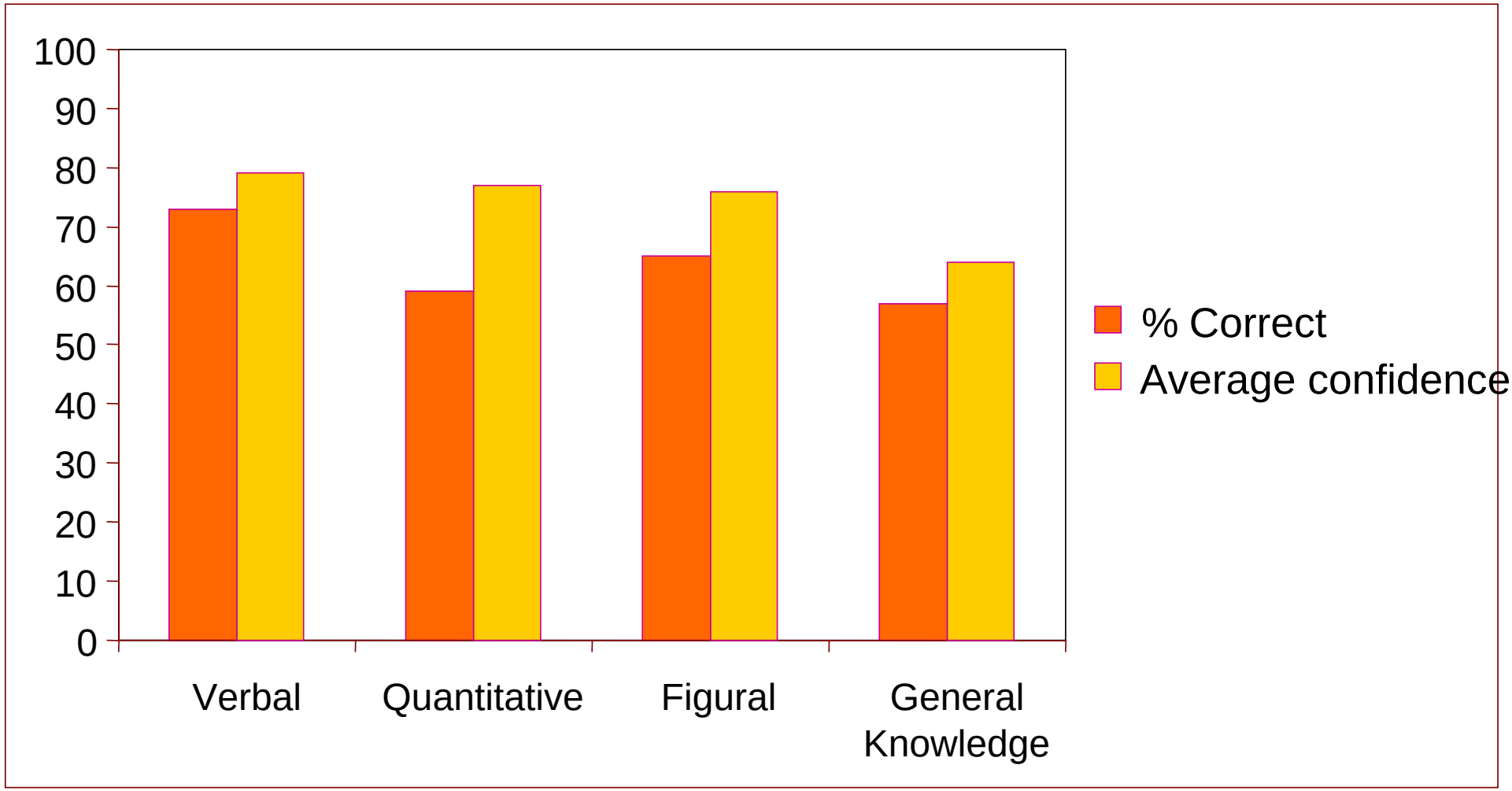
Figural
1. Figural matrices
2. Figural series.

Quantitative
1. Number Series
2. Quantitative comparisons

General Knowledge Questions

- Each test was composed of 50 items
- Each cognitive domain was represented by 2 tests
- 96 participants

Average Cognitive Performance and Confidence Ratings



The metacognitive measures:

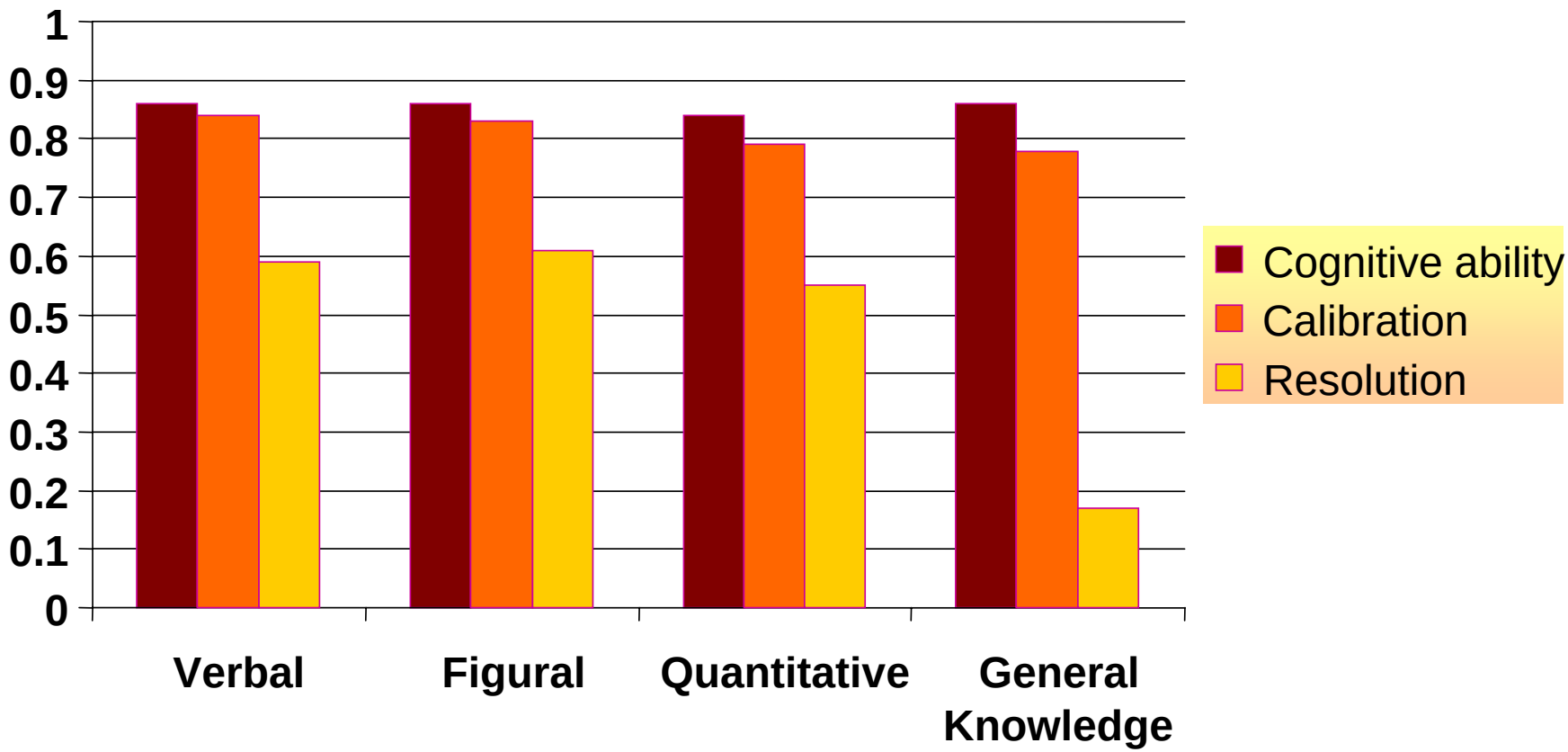
1. **Monitoring resolution:** The within person gamma correlation between confidence and the correctness of the answer.

2. **Calibration**: The difference between mean confidence ratings and the percentage of correct answers.

The average values of the metacognitive measures:

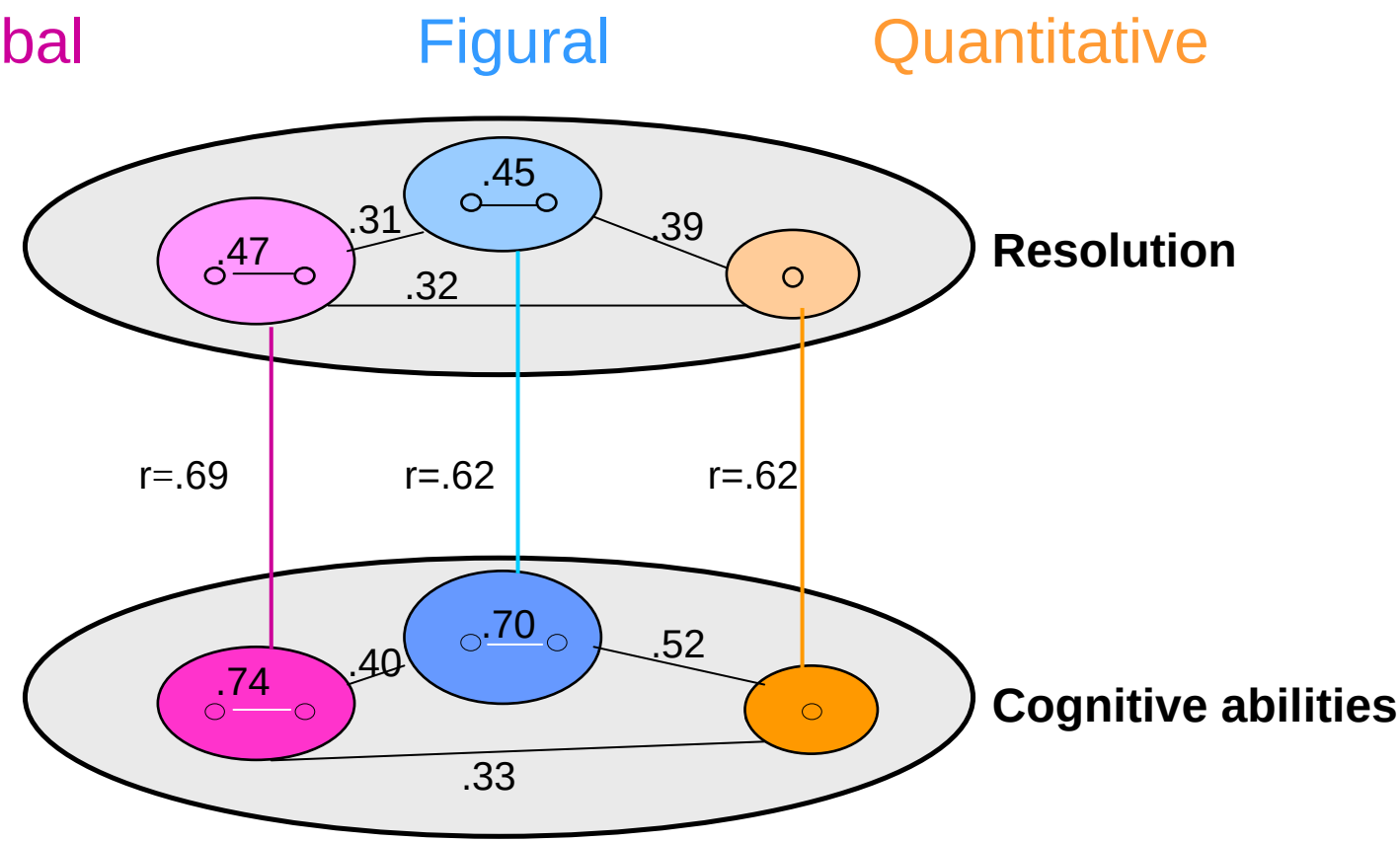
	Verbal	Figural	Quantitative	General Knowledge
Calibration (Overconfidence)	5.4	10.4	10.9	7.4
Resolution	.54	.61	.66	.50

Split-half reliabilities of cognitive and metacognitive measures:

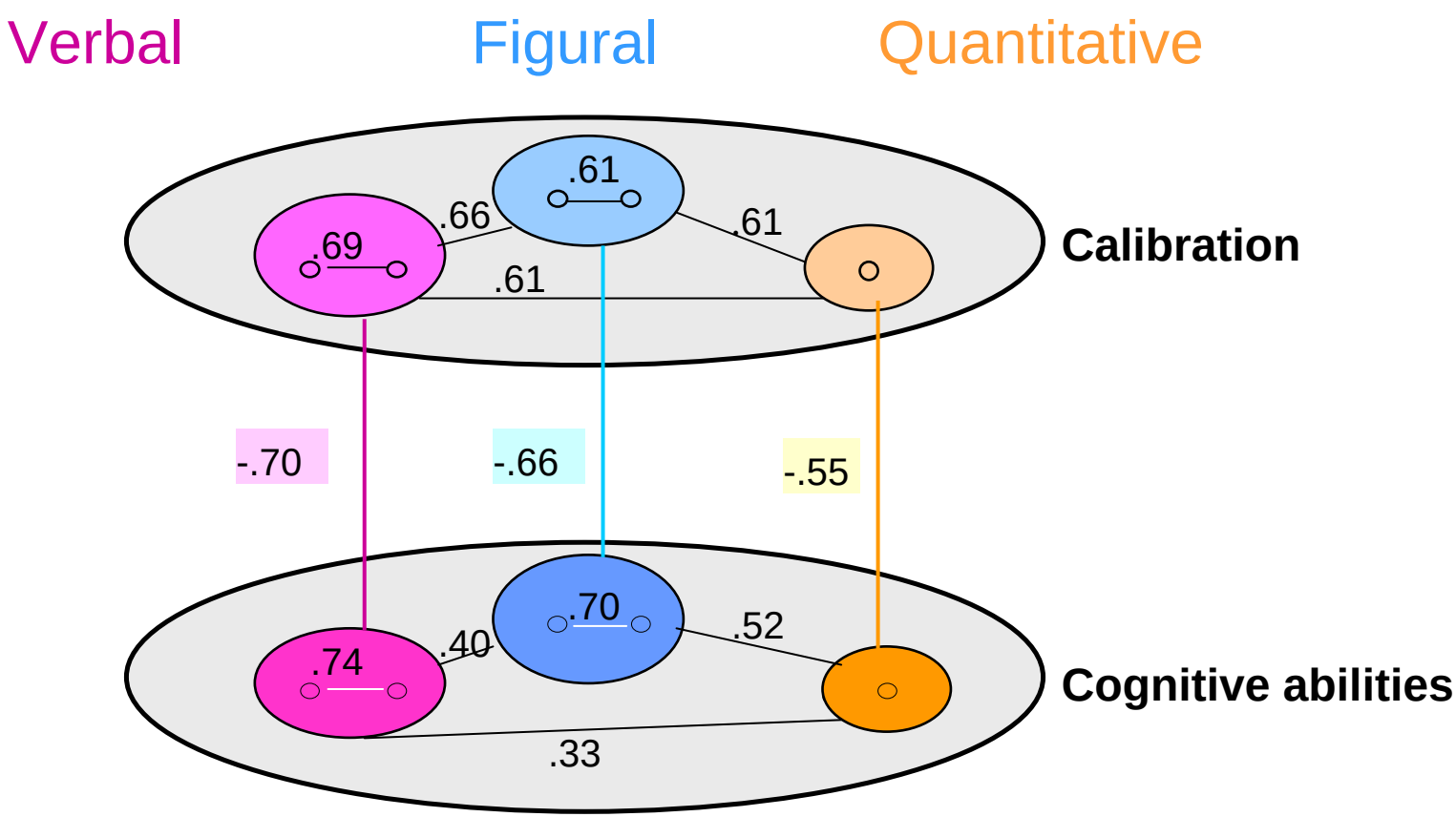


Thus, the results for the General Knowledge test represent an exception rather than being the rule.

The structure of metacognitive abilities and their relationships to cognitive abilities: Resolution



Calibration



Conclusions:

1. Individual differences in metacognitive accuracy are relatively reliable and stable across domains.
2. There are positive relationships between metacognitive accuracy and cognitive ability.
3. The structure of meta-cognitive abilities in terms of resolution moderately mirrors the structure of cognitive abilities.
4. The structure of calibration does not parallel that of cognitive ability. Calibration is not specific to a cognitive domain.

An open question:

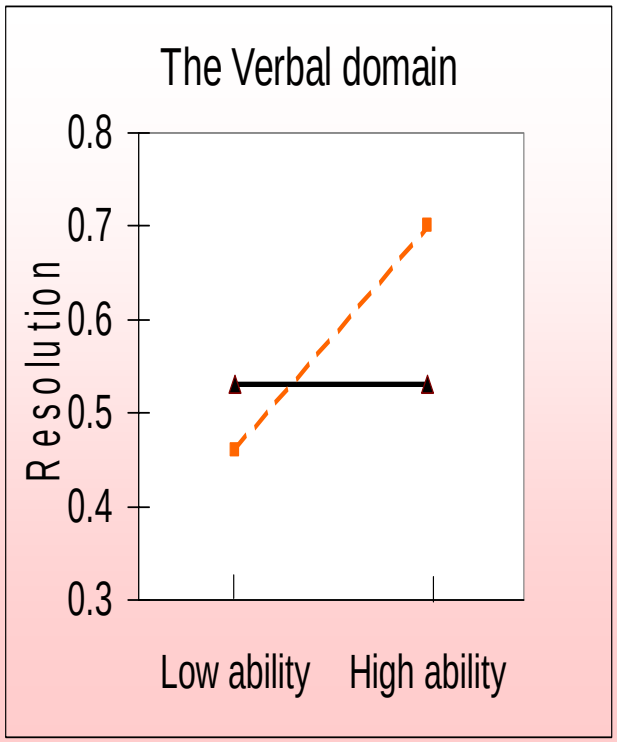
What is the basis of the positive relationship between resolution and cognitive performance?

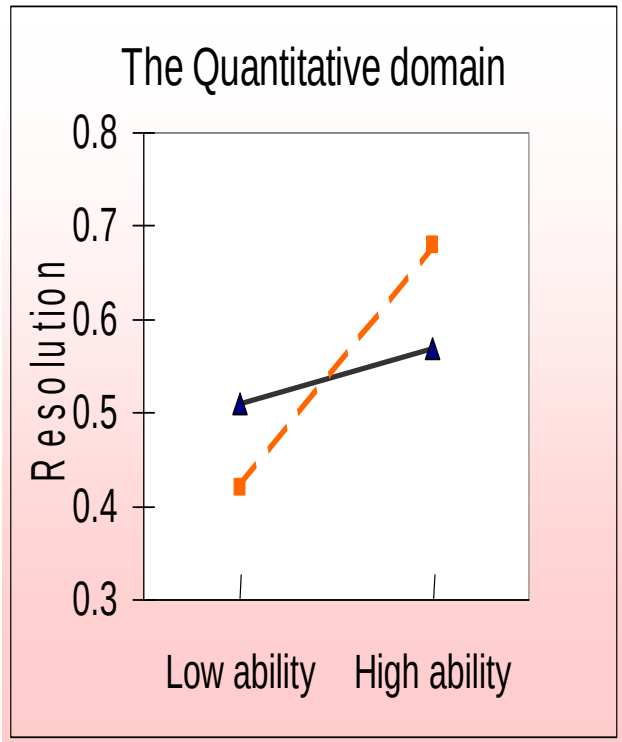
- Better resolution leads to better performance
  (Koriat & Goldsmith,1996)

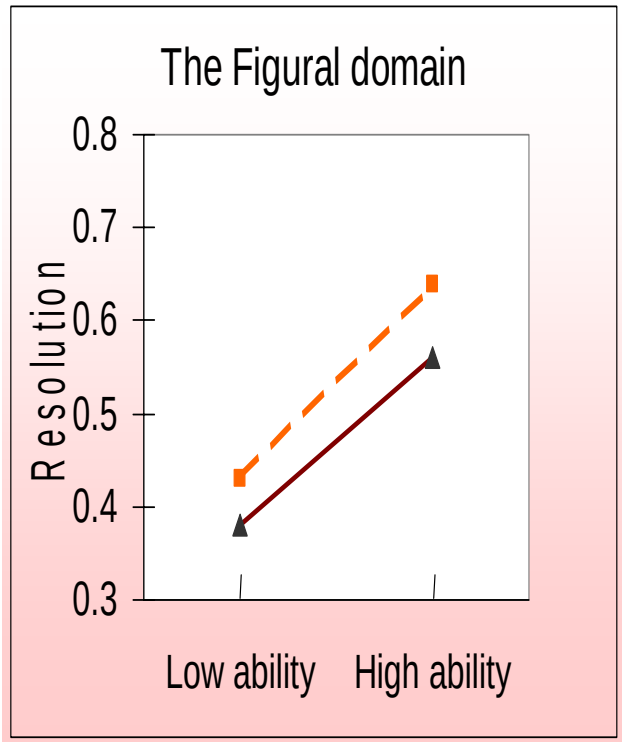
- Better resolution results from higher ability.
  (Nickerson,1999)

- Stems from the subjective difficulty of the task.

Resolution for high and low-level ability participants: All items vs. selected items







Resolution estimated across the entire set of items

Resolution for selected items where the performance was equated

"It ain't what you don't know that gets you into trouble.

It's what you know for sure that just ain't so"

Mark Twain

In problem solving, meta-cognition is involved in several stages :

- Encoding and representation of the problem
- Effective planning of the steps towards the target
- Determining sub-targets
- Comparing the solution with the target
- Evaluation of the solution.

In General Knowledge questions meta-cognition is involved solely in the evaluation of the solution.

(Davidson & Sternberg,1998)

Possibly then the qualitative differences between these two types of tasks reflect the greater involvement of meta-cognition in problem solving then in General Knowledge questions.