

Le misure in psicologia sono significanti?

Il caso del test della Torre di Londra

Ottavia M. Epifania, Luca Stefanutti, Pasquale Anselmi, Andrea
Brancaccio, Debora de Chiusole



Dipartimento di Filosofia, Sociologia, Pedagogia e Psicologia Applicata,
Università di Padova

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Simposio: Crisi di replicabilità o crisi di validità? L'importanza delle
misure

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1 Meaningfulness

2 The case in point

- Tower of London
- Scoring systems

3 Real data application

4 Final remarks

The ratio between the measures of a and b is constant and independent of the measurement unit:

$$\frac{\varphi(a)}{\varphi(b)} = \frac{\varphi'(a)}{\varphi'(b)},$$

where φ and φ' are two different scales of measurement of the same variable.

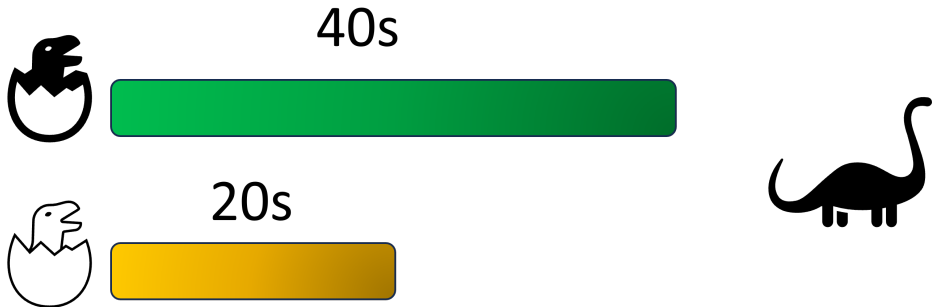
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Meaningful comparisons

The comparison between a and b is meaningful if it is invariant under all the unit transformations.





40s

20s



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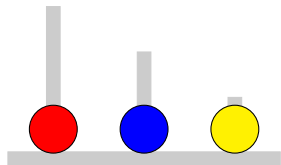
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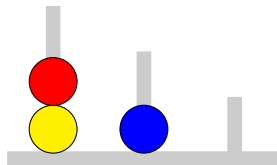
Meaningfulness

└ The case in point

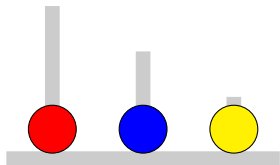
└ Tower of London



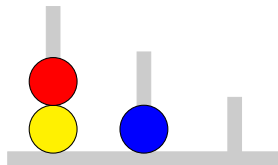
Starting configuration



Goal configuration



Starting configuration



Goal configuration

Item difficulty influenced by:

- Number of moves
- Number of alternative paths
- Hierarchy of the starting/goal configuration

Shallice (1982)

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└ Scoring systems

Scoring	Attempts	Response times	Item score	Total score
Shallice 1	✓	✓	0-1	0-12
Shallice 2	×	✓	0-3	0-36
Anderson et al.	✓	✓	0-9	0-108
Kirkorian et al.	✓	×	0-3	0-36

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Shallice 2 – SH2

Anderson et al. – AN

For each of the 12 items:

Assign	if time is
3	≤ 15 s
2	$15 \div 30$ s
1	$30 \div 60$ s
0	> 60 s

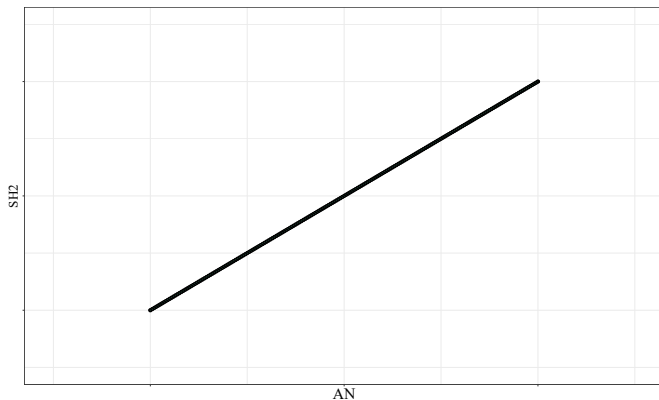
For each of the 12 items:

Assign	if time is
9	≤ 6 s
8	$6 \dashv 10$ s
7	$11 \dashv 20$ s
6	$21 \dashv 40$ s
5	$41 \dashv 60$ s
0	> 60 s

Subtract the number of unsuccessful attempts

Both scorings are based on the discretization of the response times →
There should not be differences in the **order** of the total score of the respondents according to the scoring method

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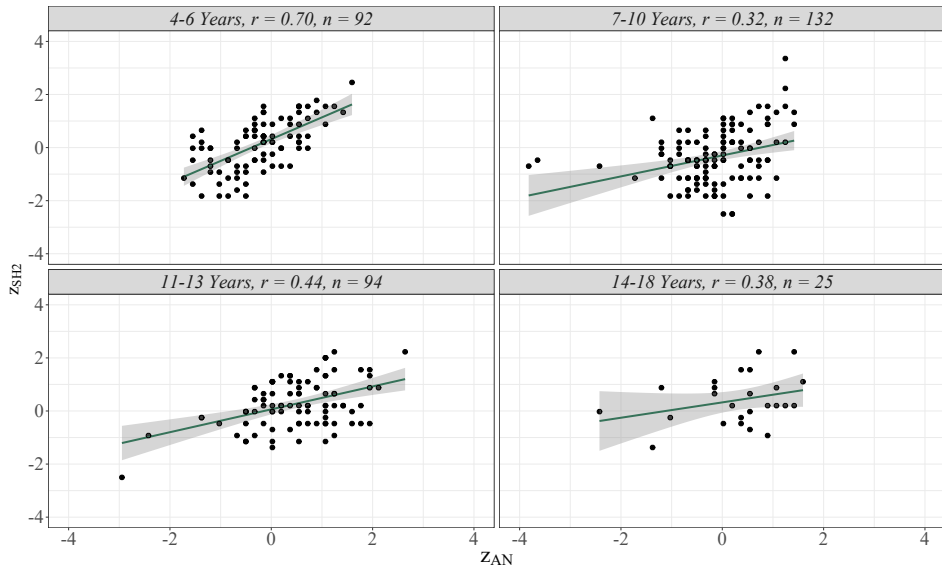
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Is it really bad...?

Respondents $i, j \in \{1, \dots, N\}$

- AN Comparison (Δ_{AN}): The standardized AN score of each subject i is compared against the standardized AN score of every other subject j

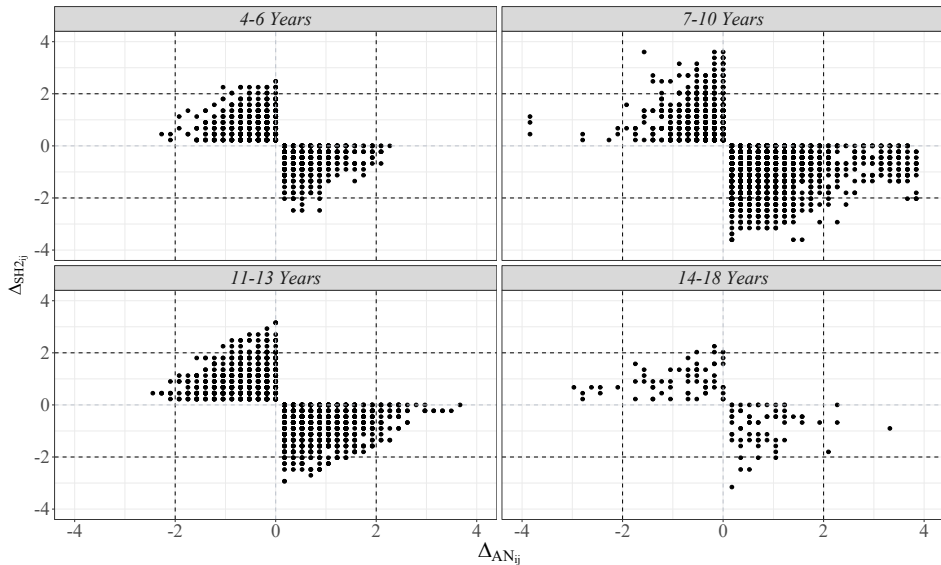
$$\Delta_{AN_{ij}} = z_{AN_i} - z_{AN_j}$$

- SH2 Comparison (Δ_{SH2}): The standardized SH2 score of each subject i is compared against the standardized SH2 score of every other subject j

$$\Delta_{SH2_{ij}} = z_{SH2_i} - z_{SH2_j}$$

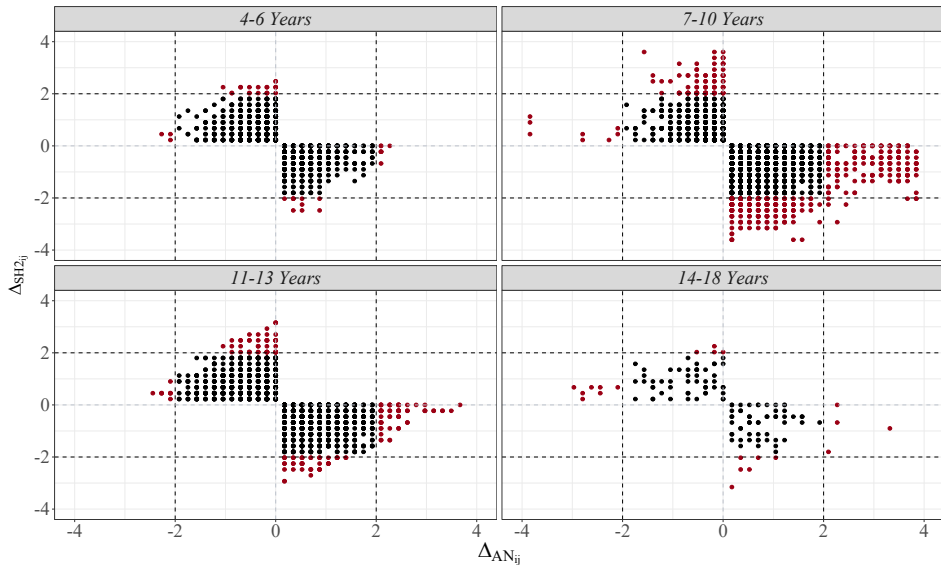
Meaningfulness

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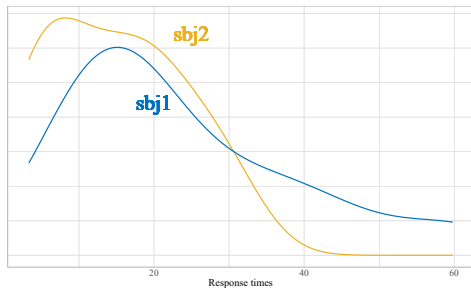


Meaningfulness

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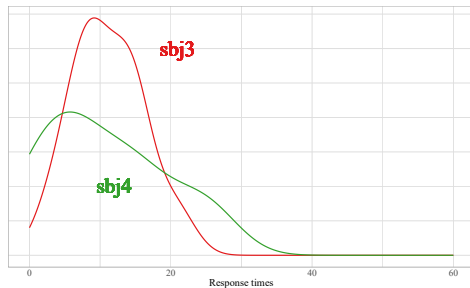
$$\Delta_{AN} > 2 \text{ \& } \Delta_{SH2} \approx 0$$



	z_{AN}	z_{SH2}	Accuracy	Time (sd)
sbj1	-1.55	0.43	0.75	24.10 (15.60)
sbj2	0.72	0.43	0.75	14.51 (9.22)

	Δ_{AN}	Δ_{SH2}
sbj1 - sbj2	2.27	0.00

$$\Delta_{AN} \approx 0 \text{ \& } \Delta_{SH2} > 2$$



	z_{AN}	z_{SH2}	Accuracy	Time (sd)
sbj3	-0.15	1.55	0.75	11.14 (4.96)
sbj4	0.20	-0.70	0.58	10.72 (8.60)

	Δ_{AN}	Δ_{SH2}
sbj3 - sbj4	-0.35	2.25

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④ **Final remarks**

Highlights

- Different scoring systems → The focus is shifted: Fast and furious or slow and steady?
- Different scoring systems might favor a cognitive theory over a contrasting one (raising also replicability issues)

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Thank you!

ottavia.epifania@unipd.it