



Attentional control can be extracted at the latentvariable level from working-memory tasks – But this finding is not replicated across datasets

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Attentional control and its issues

- Attentional control = Our ability to maintain and implement a goal and goal-relevant information in the face distraction (e.g., von Bastian et al., 2020, PsyArxiv)
- Recent research has put forward the difficulty of establishing attentional control at the latent-variable level with the measures used so far (e.g., Karr et al., 2018, Psychol Bull; Rey-Mermet et al., 2018, JEP:LMC; 2023, PsyArxiv).
- This asks for other ways of measuring attentional control.





... may be to extract attentional control from:

working-memory (WM) tasks

(= tasks used to assess the temporary maintenance and manipulation of information)

short-term memory (STM) tasks

(= tasks used to assess the temporary maintenance of information only)



Two models

<u>Residual</u> variance from WM tasks <u>Common</u> variance across WM and STM tasks



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The main goal was ...

 to test both models systematically in order to determine whether attentional control can be <u>reliably</u>* extracted from working-memory tasks.

* Good fit to the data and coherent factors



Systematic search of datasets

Inclusion criteria

- Adults aged between 18 and 45
- At least 8 tasks

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Identified studies:
N = 1601
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- Half working-memory tasks, half short-term memory tasks
- Half one type of material, half another type of material
- A minimum sample size estimated from a power analysis
 - 200 participants in case of 8 tasks
 - 150 participants in case of 12 tasks
- Partial-credit scoring procedure

Included datasets: N = 3

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Data analysis

- Re-analysis using:
 - 1. the original correlation matrix
 - 2. **5000 simulated** correlation matrices
- Focus on 3 aspects:
 - How well do the model fit to the data?
 - Are the factors **coherent**?
 - How often do the model fit to the data and the factors are coherent?



Kane et al. (2004) – Task features



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Kane et al. (2004) – Original correlation matrix <u>Residual</u> variance from WM tasks



Note. CFI = 1, RMSEA = .03, SRMR = .02, AIC = -4770, BIC = -4642. Bold = *p* < .05.



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Kane et al. (2004) – Original correlation matrix Common variance across WM and STM tasks



Note. CFI = .99, RMSEA = .04, SRMR = .02, AIC = -4765, BIC = -4637. Bold = *p* < .05.



Kane et al. (2004) – 5000 simulated correlation matrices



= results using the original correlation matrix



Hale et al. (2011)



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Hale et al. (2011)



= results using the original correlation matrix



Rey-Mermet and Rothen (2023)





Rey-Mermet and Rothen (2023)

Working memory: 2 updating tasks





Rey-Mermet and Rothen (2023)



= results using the original correlation matrix



Do the typical model modifications improve the model estimations?

Typical model modifications

As originally proposed

Both maintenance factors were allowed to correlate

Error variances from the same material were allowed to correlate

Factor loadings were con

The maintenance factors

Response: No!

All factors were allowed to correlate

Maintenance and attentional-control factors were allowed to correlate

All measures were forced to load on one factor

Two material-specific factors of attentional control were modeled

Is our approach valid?

 We applied our approach on 2 correlation matrices and wellestablished intelligence models

Wechsler Adult Intelligence Scale (4th Edition)

Wechsler Intelligence Scale for Children (5th Edition)





Is our approach valid?



= results using the original correlation matrix





 In Kane et al. (2004), attentional control could be extracted at the latentvariable level from working-memory tasks.

But:

- These model estimations were <u>not robustly observed</u> when the 5000 correlation matrices were used.
- These model estimations were <u>not replicated</u> across the other datasets (Hale et al., 2011; Rey-Mermet & Rothen, 2023).



Conclusion

- Using working-memory and short-term memory tasks does not solve the difficulty of establishing attentional control at the latent-variable level.
- We <u>cannot</u> use working-memory tasks to reliably extract attentional control.



Thank you for your attention!

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