

"All cognitive scientists are nerds.
Some nerds are nice people."



What, if anything, follows?

Syllogistic reasoning:

Why do individuals differ in their performance?

An individual's cognitive ability explains the greatest amount of variance - but personality also matters!

Investigating the Individual Differences in Syllogistic Reasoning

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MOTIVATION

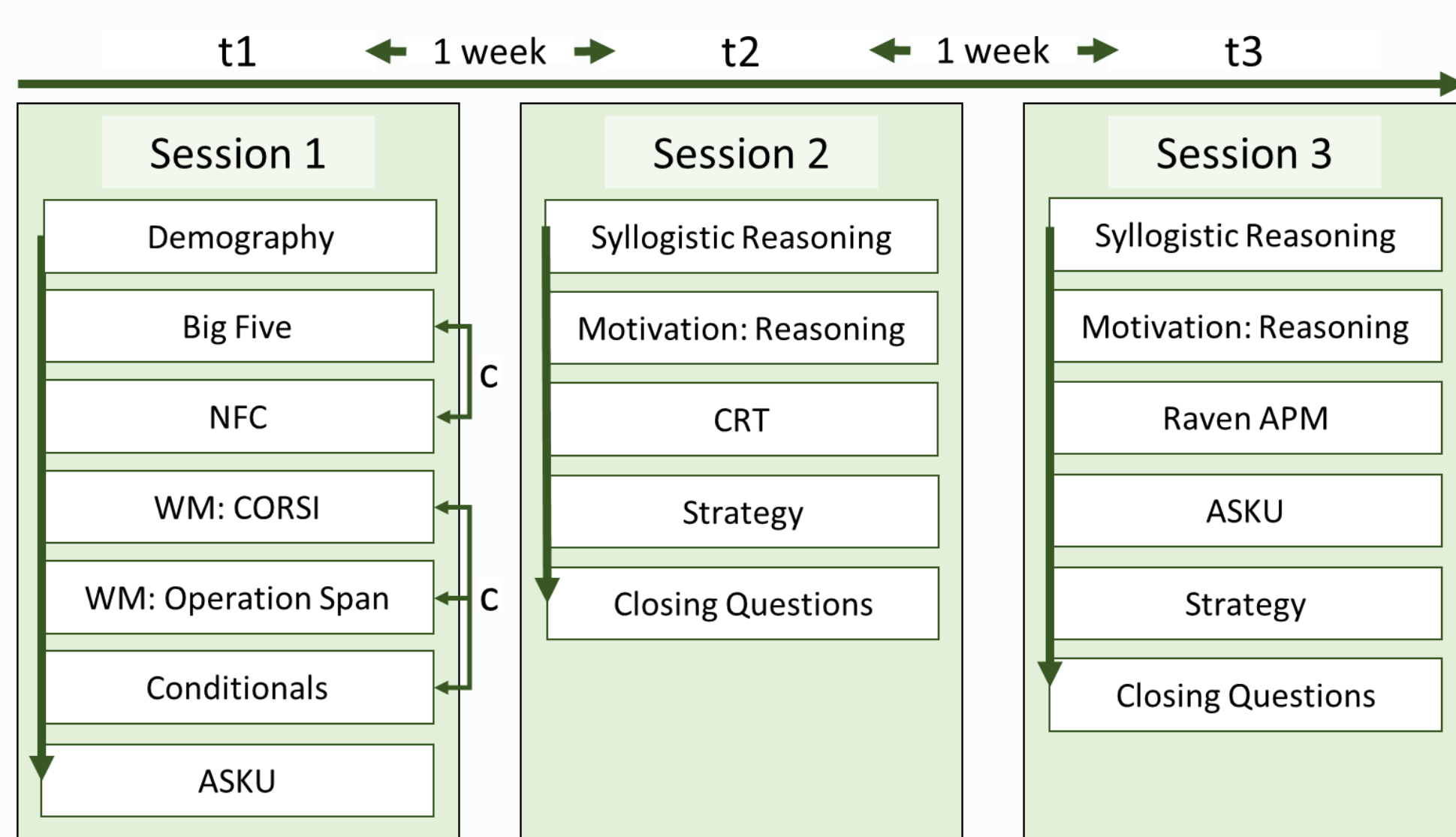
- Individuals differ in their ability to reason logically (e.g., Frey et al., 2018; Galotti et al., 1986; Khemlani & Johnson-Laird, 2016; Stanovich & West, 2000).
- Why are some individuals able to draw a logically correct conclusion and others are not?
- Despite the numerous studies on *how* individuals differ: only few studies on associated/underlying reasons of such differences (e.g., Neys & Bonnefon, 2013; Svedholm-Häkkinen, 2015; Visconti & Kunzendorf, 2015), e.g., looking at influences of specific individual characteristics such as personality traits
- Aim: To gain further insights into
 - 1st *why* we find individual differences in reasoning performance (by investigating individual's characteristics) &
 - 2nd *when* we observe such differences within a session (investigating reasoning performance over time)

Research Questions

- RQ1:** Are personality traits influential factors on reasoning performance? (explorative: comparison to cognitive abilities)
- RQ2:** Does individuals' reasoning performance improve within a session?
- RQ3:** Are the changes of reasoning performance over the session related to individuals' personality and cognitive abilities?

METHOD

- 74 participants, 3 test sessions
- 64 syllogisms with all possible 9 responses (generation task)
- Tested with (generalized) linear mixed models



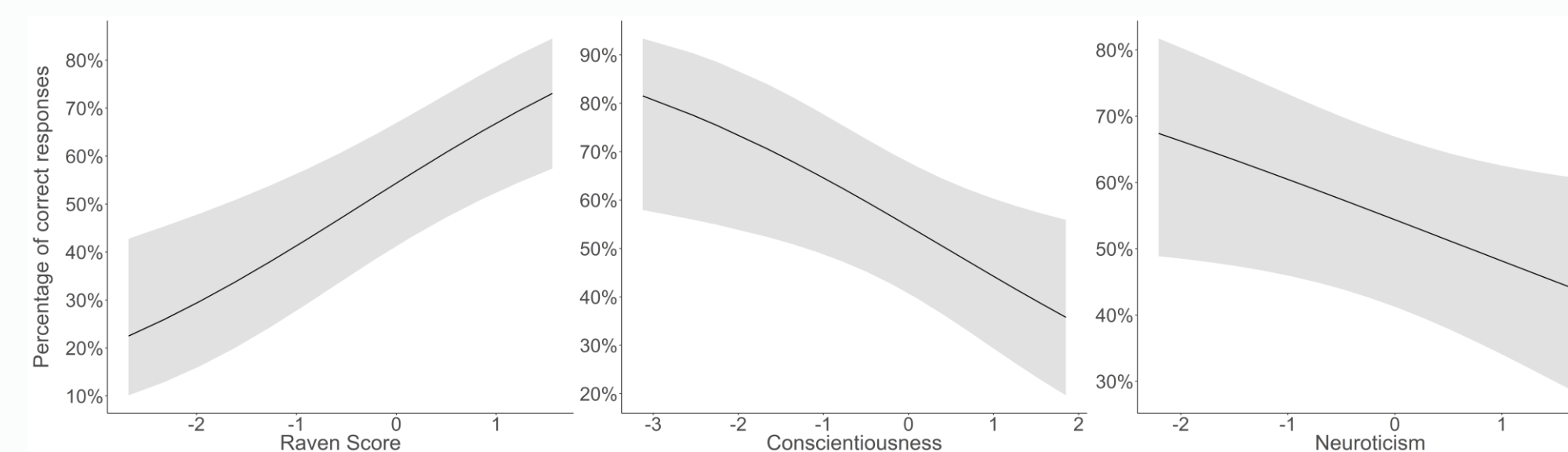
Tests and measures used over the three study sessions. "c" indicates counterbalances order.

RESULTS of ANALYSIS

Final GLMM results for response correctness (when personality only: model: conscientiousness important as well)

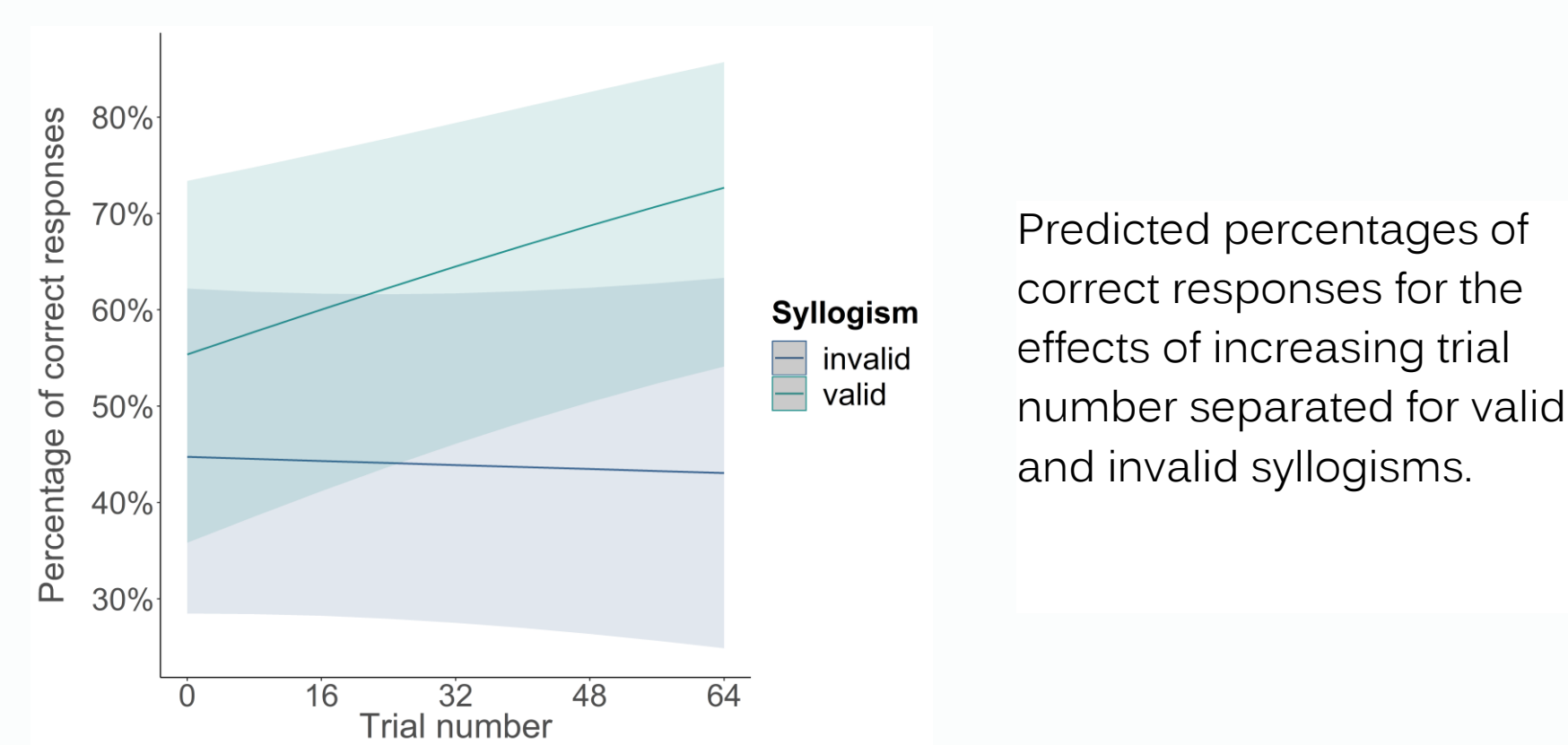
Predictors	Best Model					
	β	SE	Odds Ratios	CI	z-value	p
(Intercept)	.18	0.27	1.19	0.70 – 2.02	0.65	.515
Validity	-.42	0.26	0.66	0.39 – 1.10	-1.60	.109
N _{Trial}	.09	0.05	1.09	1.00 – 1.19	1.87	.061
Extraversion	-.02	0.13	0.98	0.76 – 1.27	-0.14	.892
CRT	.51	0.15	1.67	1.24 – 2.24	3.38	.001
Raven	.53	0.15	1.69	1.26 – 2.27	3.53	<.001
Neuroticism	-.25	0.13	0.78	0.60 – 1.00	-1.93	.054
Validity: N _{Trial}	-.10	0.05	0.90	0.81 – 1.00	-1.96	.050
Extraversion: N _{Trial}	.09	0.05	1.09	1.00 – 1.20	2.00	.045
CRT: N _{Trial}	.16	0.05	1.17	1.07 – 1.28	3.31	.001

Raven, Conscientiousness, & Neuroticism



Predicted percentages of correct responses for the effects of the standardized scores for Raven, Conscientiousness, and Neuroticism.

Reasoning Performance Over Time



Predicted percentages of correct responses for the effects of increasing trial number separated for valid and invalid syllogisms.

MAIN CONCLUSIONS

- RQ1:** Neuroticism, Conscientiousness, and Extraversion are associated with reasoning performance - to some degree similar to intelligence-personality relations (e.g., Carretta & Ree, 2018). For Openness and NFC hypothesized influences cannot be confirmed.
- Personality influences seem to be rather subtle in comparison to cognitive ability measures (e.g., Raven)
- RQ2:** Some participants improve over a session but only for valid syllogisms
- RQ3:** CRT and Extraversion appear to be associated with the improvement over time

Implications

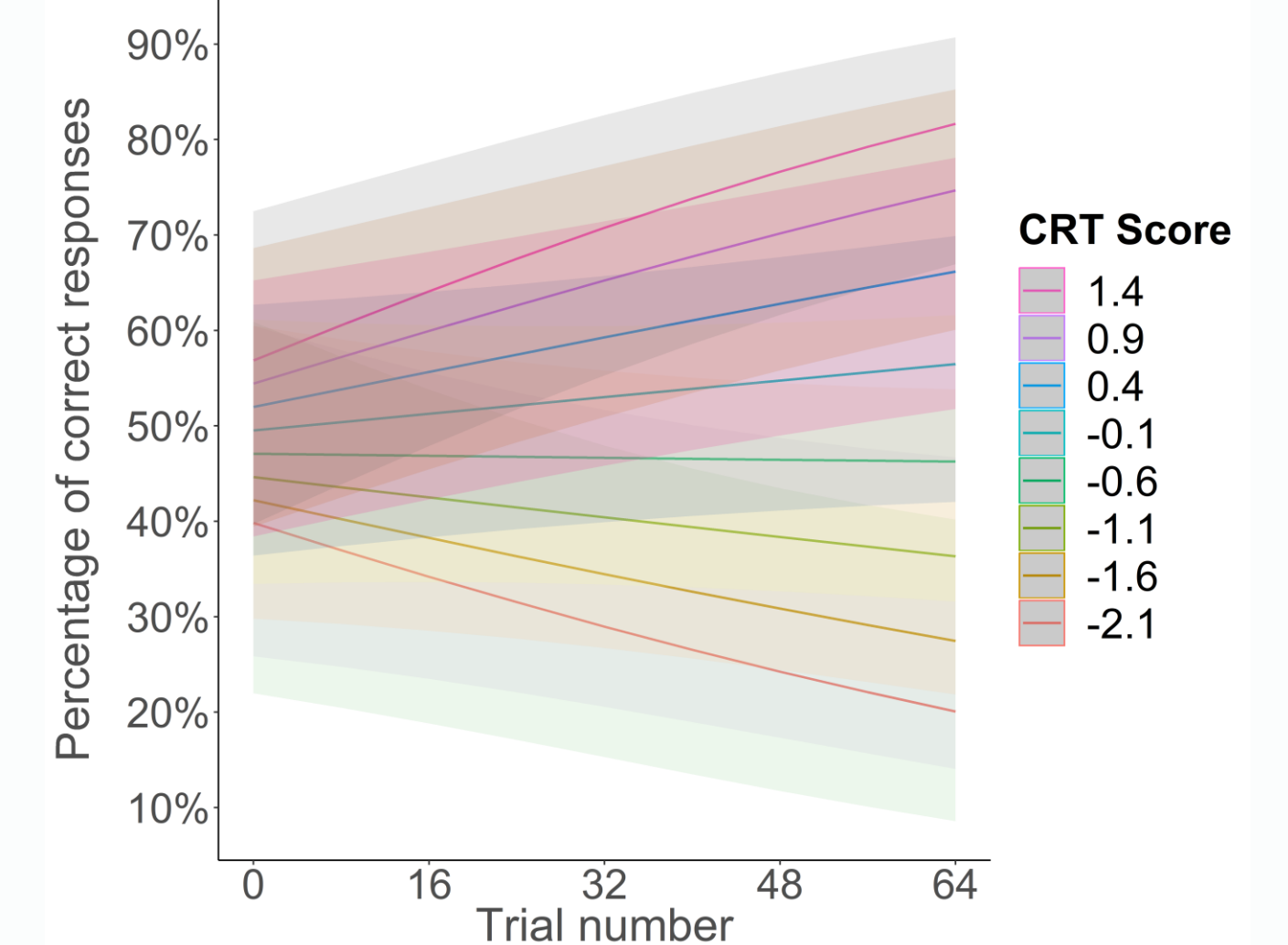
- When testing many syllogisms at once, we may not only measure an individual's ability to reason logically but also the consequences of other processes unfolding over time (e.g., strategy selection) which may in turn be related to individual characteristics
- Cognitive models of reasoning should account for such individual differences unfolding over time (beyond influences of NFC and CRT)

Supporting Tables & Figures

Random Effects	s ²
Participant (intercept): 1.20	1.20
Syllogism (intercept): 3.38	3.38
Validity (by-participant slope)	0.93
N _{Trial} (by-participant slope)	0.02
Validity:N _{Trial} (by-participant slope)	0.07
Observations	4736
Marginal R ² / Conditional R ²	0.109 / 0.676

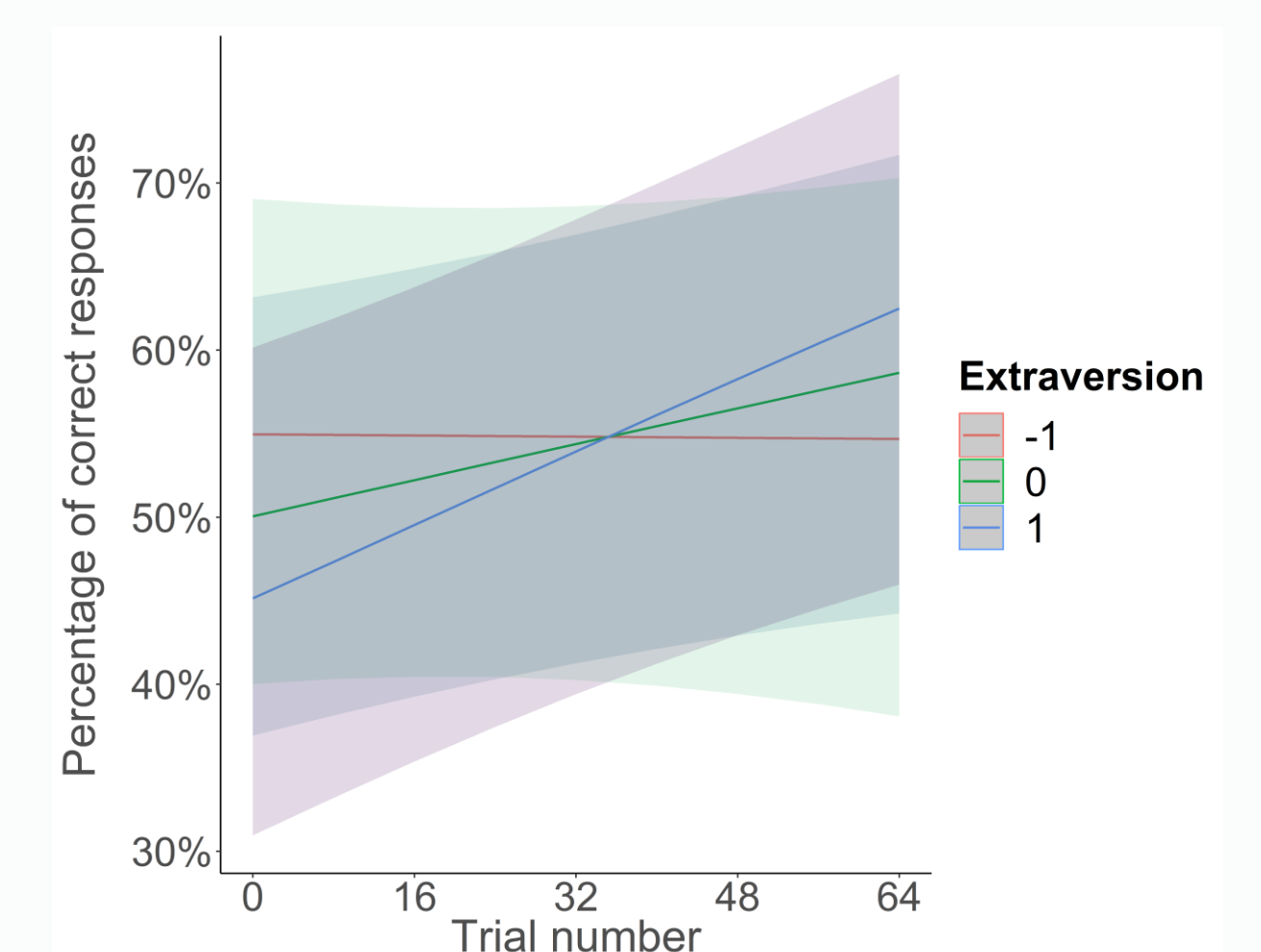
Cognitive Reflection Test & Trial number

Predicted percentages of increasing trial number differentiated for CRT scores (Lines represent model predictions when all other predictors are held constant (at their mean))



Extraversion & Trial number

Predicted percentages of correct responses for the effect of increasing trial number separated for Extraversion scores



References
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