

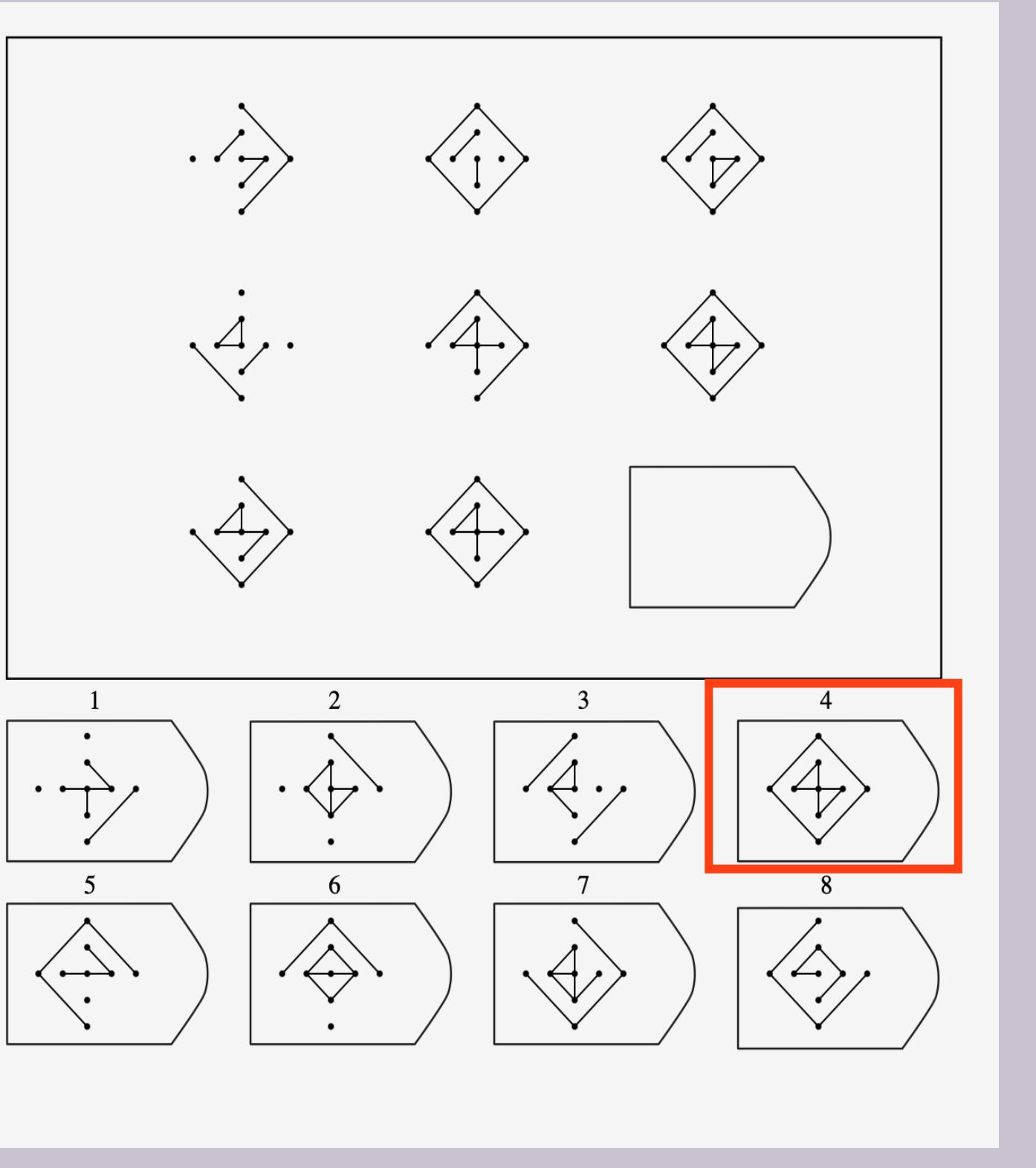
## Introduction

- The International Cognitive Ability Resource (ICAR) (Condon & Revelle, 2014; Dworak et al. 2021; Revelle et al., 2020) is a public access tool for evaluating individual differences in cognitive ability, measuring both fluid and crystallized intelligence
- Fluid intelligence encompasses abstract reasoning that relates to working memory capacity (Harrison et al., 2015)
- Matrix reasoning tasks tend to be robust measures of fluid intelligence (Harrison et al., 2015)
- The following Raven's-like matrix reasoning task may serve as a useful open-source alternative to other matrix reasoning measures

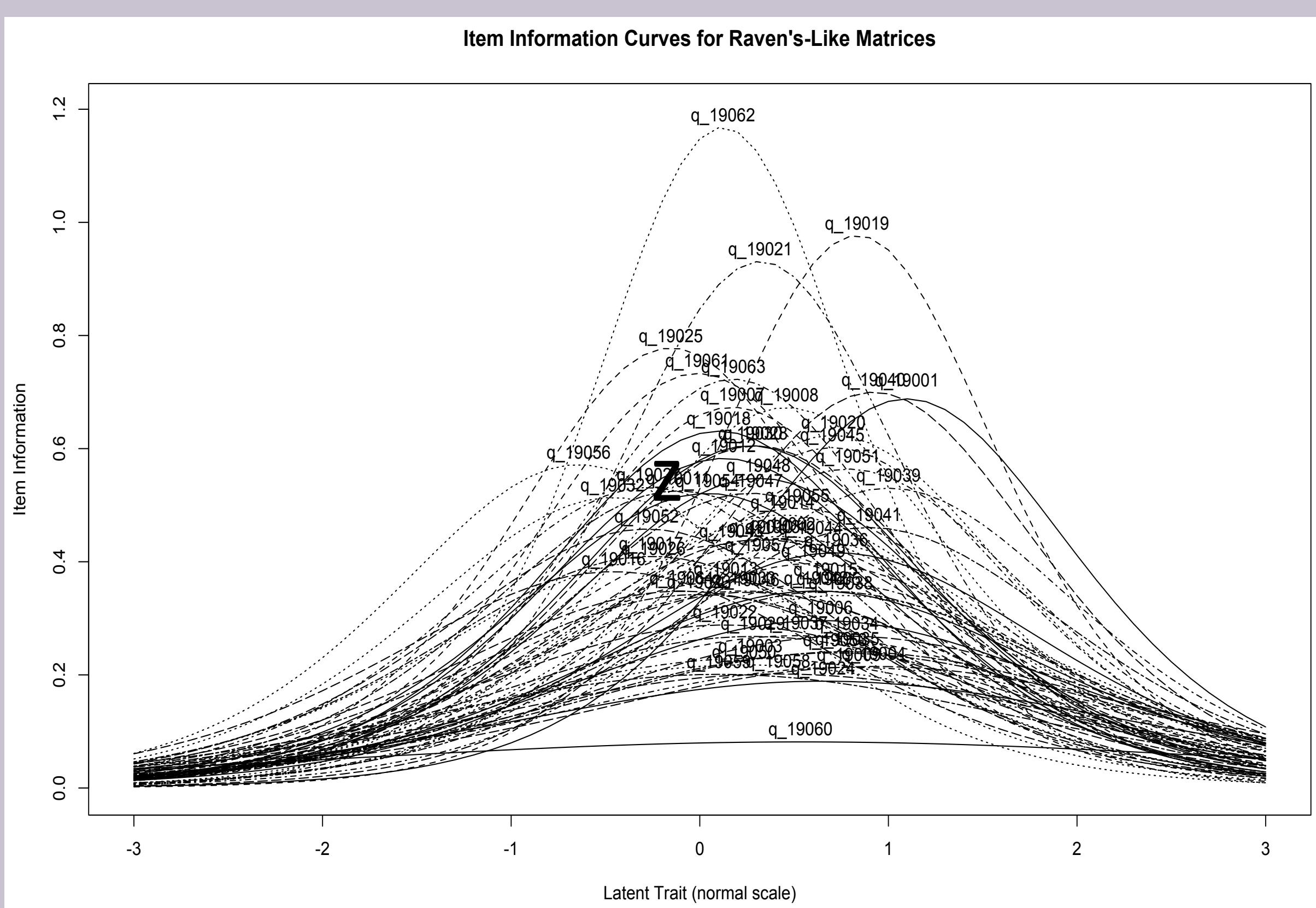
## Methods

- Raven's-like Matrices initially developed for the ICAR by Dr. Yin Wah Fiona Chan (Chan, 2018) were administered as part of the Synthetic Aperture Personality Assessment (SAPA) project (Condon, 2018) to participants worldwide ( $N = 346,861$ ) through a massively missing completely at random (MMCAR; Revelle et al., 2017) sampling procedure
- The Raven's-like Matrices were administered to participants from February 7, 2017, to November 18, 2019
- Participants were asked to select the response option that best solves the matrix (see sample item)
- Using the SAPA technique to form synthetic matrices, although each participant did not receive more than three of the items, the results are shown in terms of the correlations between the full scales.

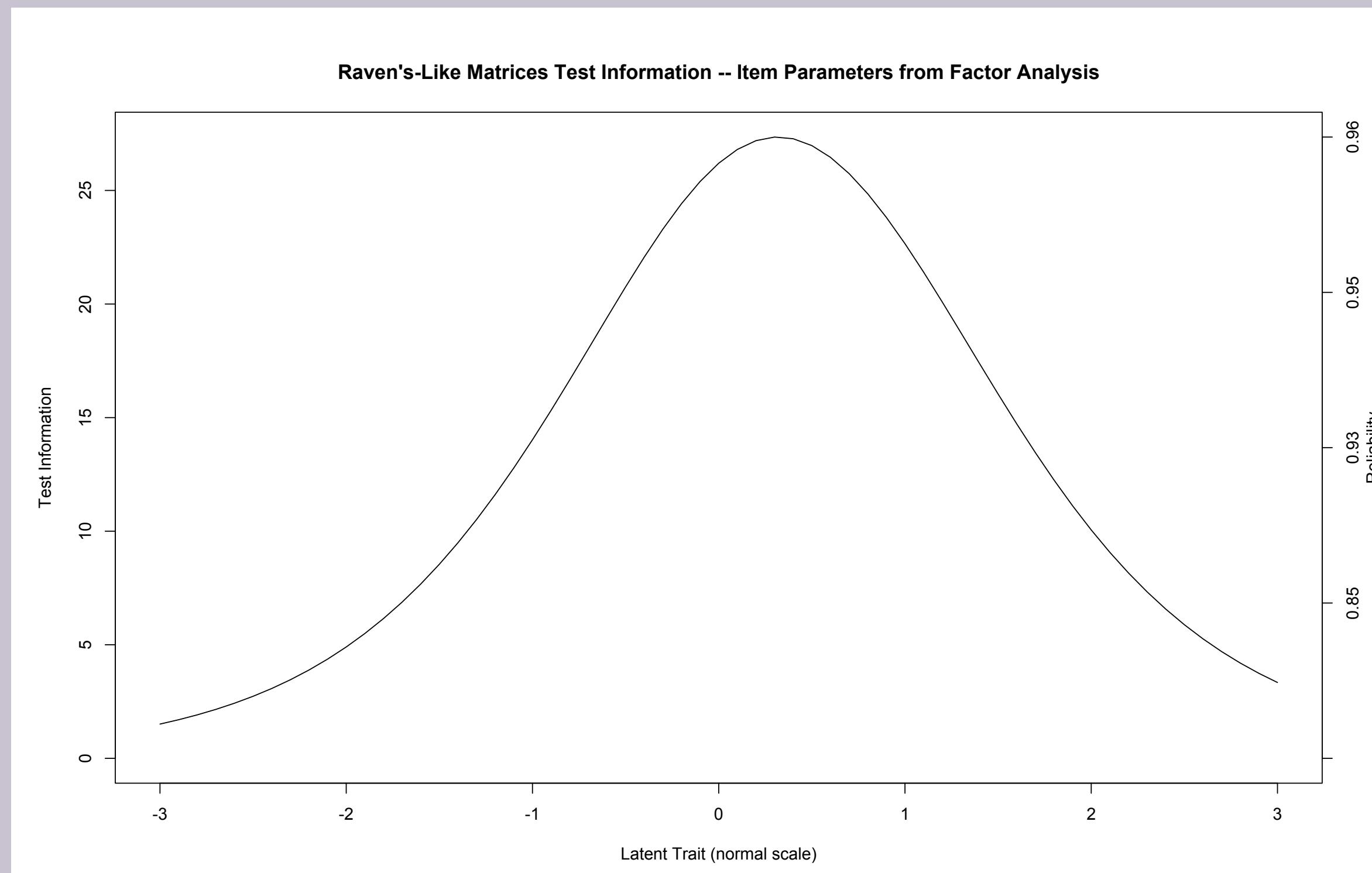
## Sample Raven's-Like Matrices Item



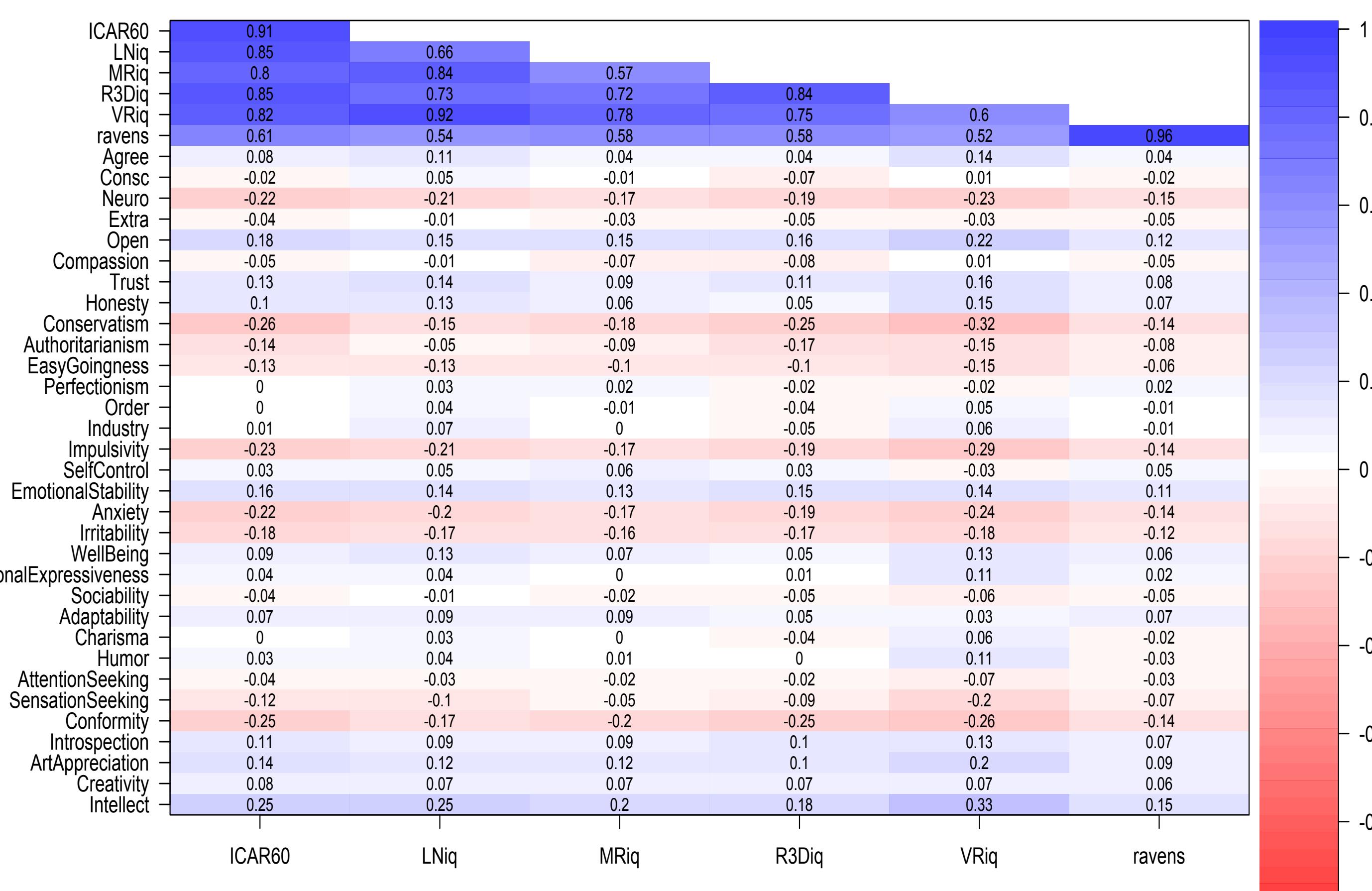
## IRT Item Information Curves for Raven's-Like Matrices



## Raven's-Like Matrices Test Information -- Item Parameters from Factor Analysis



## Scale Intercorrelations Corrected for Item Overlap and Attenuation for the Raven's-like Matrices, ICAR-60, Big 5, and SPI-27 (Condon, 2018) with Reliabilities on the Super Diagonal



## Results Summary

- The Raven's-like matrices demonstrated high internal consistency ( $\omega_h = .70$ ,  $\omega_t = .96$ ,  $\alpha = .96$ , minimum split half reliability = .93, average  $r = .26$ ).
- The Raven's-like matrices were moderately associated with the full 60-item ICAR composite (ICAR60) ( $r = .61$ ) as well as the letter and number series (LNiq) ( $r = .54$ ), matrix reasoning (MRiq) ( $r = .58$ ), three-dimensional rotation (R3Diq) ( $r = .58$ ), and verbal ability (VRiq) ( $r = .52$ ) domains of ICAR.
- Table 1 displays correlations of the Raven's-like Matrices, ICAR60, letter and number series, matrix reasoning, three-dimensional rotation, and verbal ability with several external criteria

## Correlations of Raven's-Like Matrices with External Criteria

Table 1: Raven's-like Matrices and ICAR60 Correlations with External Criteria

Variable	ICAR60	LNiq	MRiq	R3Diq	VRiq	Matrices
Career Discipline:						
Engineering and Technology	0.13	0.13	0.16	0.14	0.07	0.11
Computer and Information Sciences	0.06	0.05	0.06	0.09	0.05	0.07
Natural Sciences	0.13	0.13	0.13	0.15	0.07	0.07
Mathematics	0.09	0.08	0.10	0.07	0.07	
Language and Literature Studies	0.02	0.01	-0.01	0.00	0.08	0.00
Arts (Visual, Performing and Visual)	-0.03	0.03	0.03	0.04	0.03	0.01
Cultural and Regional Studies	0.00	-0.01	0.00	0.00	0.02	-0.01
Social Sciences	0.02	0.02	0.02	0.02	0.03	0.03
Communication Sciences	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
Community and Social Services	-0.07	-0.07	-0.07	-0.06	-0.06	-0.04
Medicine and Allied Health	-0.09	-0.07	-0.06	-0.09	-0.10	-0.05
Business Administration and Management	-0.04	-0.04	-0.04	-0.13	-0.06	-0.06
Education	-0.08	-0.06	-0.09	-0.08	-0.08	-0.06
Age	0.17	0.20	0.06	0.11	0.39	0.14
Age <sup>2</sup> (Zero-Centered)	-0.02	-0.02	-0.01	0.01	0.01	0.00
Sex (1 = Male 2 = Female)	-0.20	-0.16	-0.17	-0.22	-0.20	-0.13
Education (1 to 7; 1 = Less than High School; 7 = Graduate/Prof. Degree)	0.30	0.34	0.25	0.23	0.44	0.19
Occupation Income	0.24	0.24	0.24	0.22	0.30	0.17
Occupation Income	0.24	0.25	0.22	0.22	0.30	0.17
Parent 1 Occupation Prestige	0.09	0.09	0.09	0.11	0.06	
Parent 1 Education	0.18	0.17	0.18	0.16	0.24	0.08
Parent 2 Occupation Prestige	0.06	0.06	0.06	0.07	0.06	0.04
Parent 2 Education	0.17	0.15	0.16	0.16	0.20	0.07

## Future Directions

- Further validation analysis should be conducted on a variety of different participant samples in differing formats (e.g., type of instructions given)
- How the Raven's-like Matrices relate to other external criteria typically related to fluid intelligence (e.g., working memory capacity [Harrison et al., 2015]) should be assessed through a variety of modalities across various participant samples

## References

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