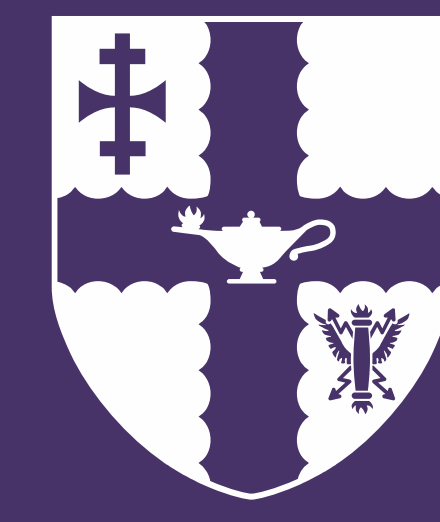


Large within subject variance in childhood IQ scores of Guatemalan high SES individuals born 1941-1953



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Background

- Previous studies have connected childhood cognitive reserve, often measured as Intelligence Quotient (IQ) scores, with various later life health outcomes, including risk of dementia and mortality¹⁻⁷.
- These studies assume relative stability in IQ test scores over the developmental period, as often only a single, un-replicated IQ measurement is available or selected to represent early life cognitive reserve.
- Other literature has questioned the relative stability of IQ scores during development and highlighted that adverse life events, an individual's developmental level and the instruments chosen can affect results significantly⁸⁻¹¹.
- Therefore it is important to explore the variation seen within and between individuals' IQ test scores to understand test precision and whether this is related to the type of test used, the administration process, or other less easily identified sources of variability.

Aims: 1) Examine within subject variance in longitudinal childhood IQ test scores 2) compare the relationship of childhood IQ scores to later life fluid intelligence test scores.

Methods

- Longitudinal childhood IQ scores were used from 42 high socioeconomic status Guatemalans born 1941-1953, now 64-76 years-old.
- Attended Colegio Americano de Guatemala (American School) and took part in Universidad del Valle de Guatemala's (UVG) Longitudinal Study of Child and Adolescent Development¹²⁻¹⁴ during youth.
- The sample represents 14% of original study participants who met the selection criteria (Figure 1).
- Novel cognitive data collected using the UK Biobank two minute fluid intelligence test¹⁵, the Spanish word accentuation test (WAT)¹⁶ and the Spanish word accentuation test Chicago version¹⁷ (Table 1).
- Using Z-scores and regression analysis, childhood IQ scores were compared with the results of the recent IQ tests administered to the participants.

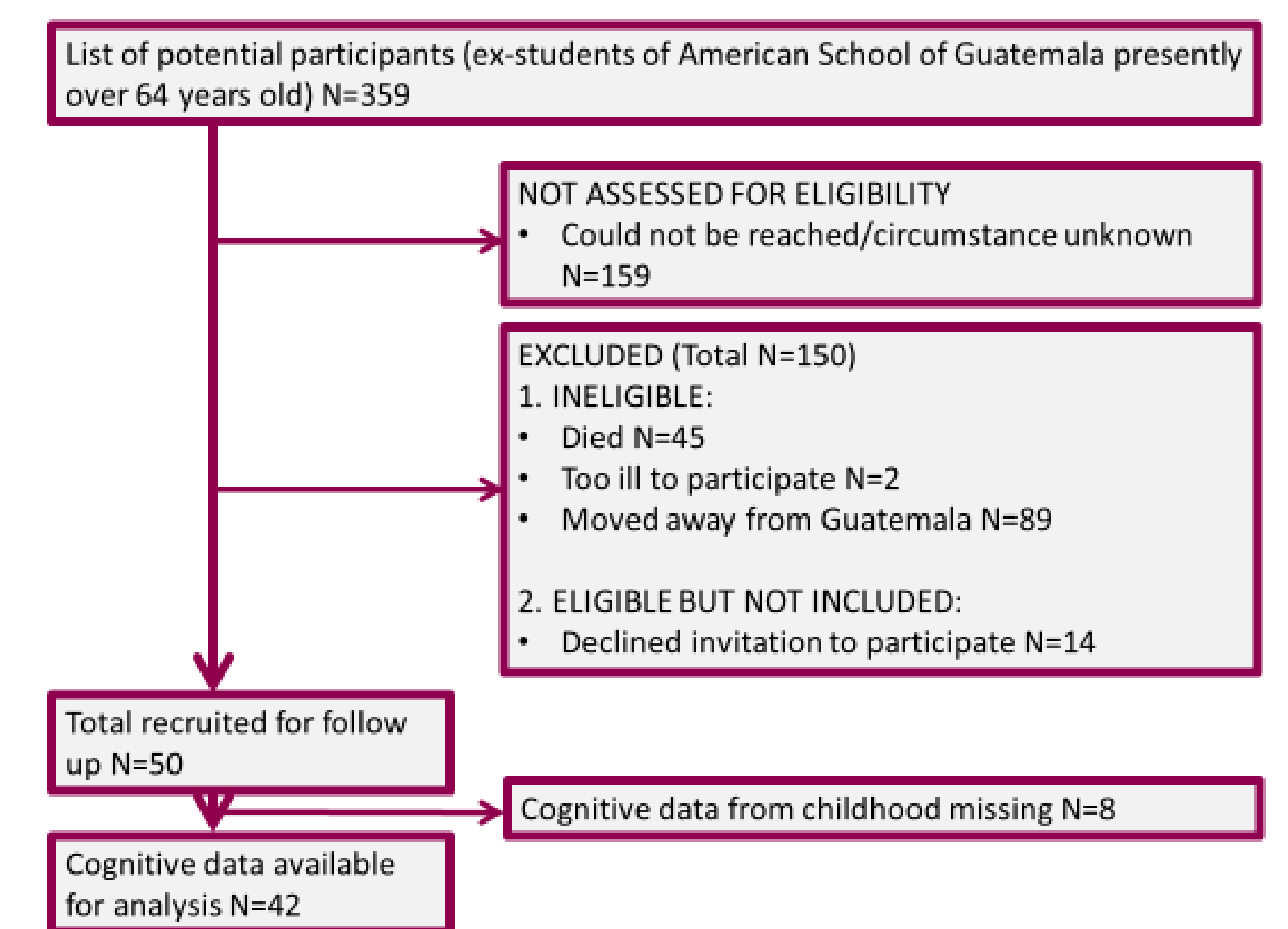


Figure 1. Follow up sample selection

Results

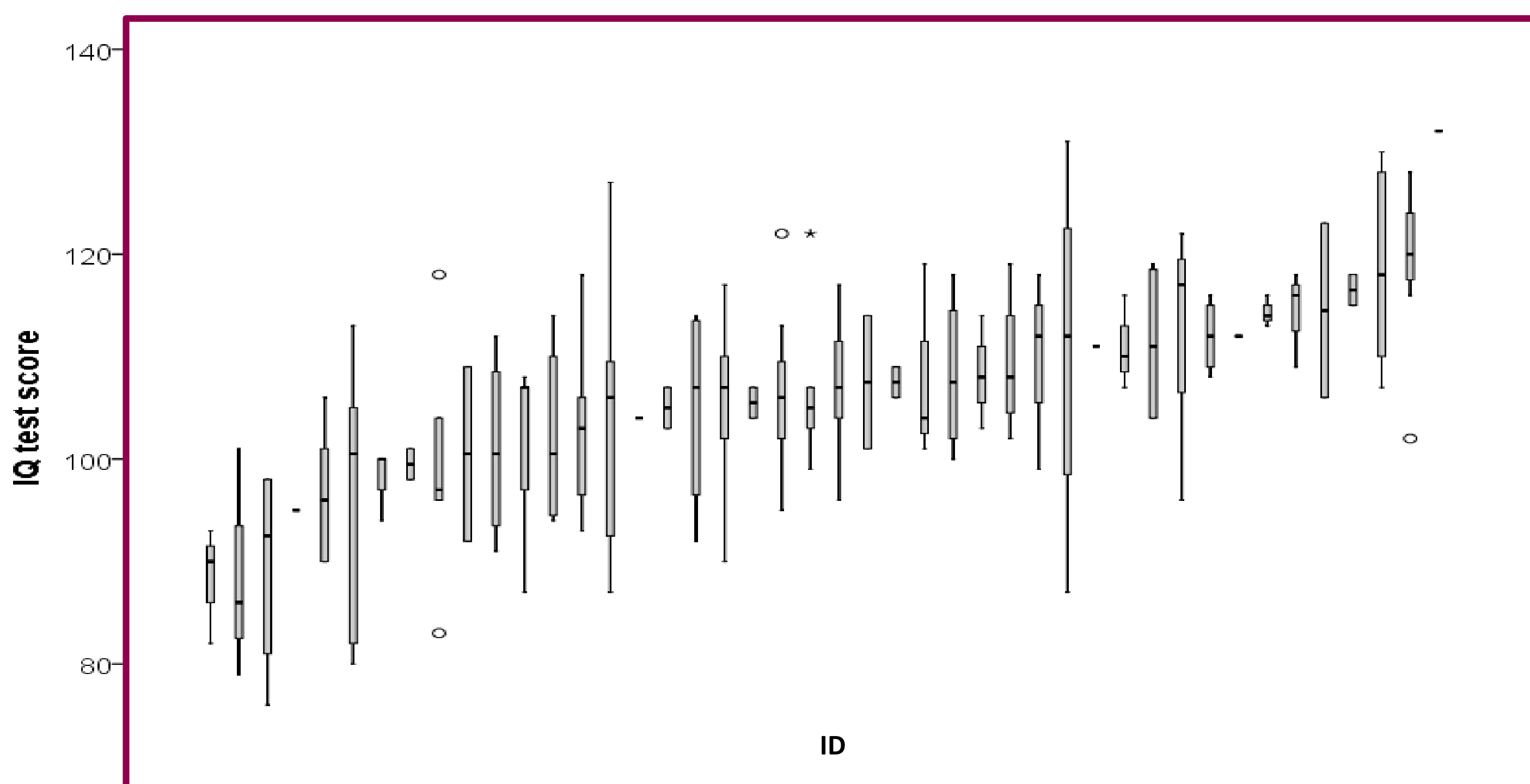


Figure 2. Childhood IQ test scores by ranked ID (median, minimum, maximum)

- Participants showed high within subject variance in childhood IQ: **62% had fluctuations of >1SD** in their scores (Figure 2).
- Average childhood IQ test Z-scores were related to older age fluid intelligence test Z-scores with 61.9% of the sample maintaining their test Z-score category (Figure 3).
- The within subject distribution of scores was not similar between individuals ($p < 0.001$).
- Only 12% of total variation in the older age scores was explained by childhood scores ($p < 0.05$).

Name of test	N participants	Mean score (IQ points unless otherwise stated)	Administered during	Mean age at testing (y)
Pintner Cunningham A	25	103.32	Preschool, 1 st year of primary school	6.87
Pintner Durost A	30	100.40	2 nd and 3 rd year of primary school	8.86
Pintner Durost B	5	98.00	3 rd year of primary school	9.41
Otis Intermedio	36	109.44	4 th , 5 th and 6 th year of primary school, 1 st and 2 nd year of middle school	11.36
Pintner General Intermedio	29	109.45	5 th and 6 th year of primary school	11.90
Otis Superior	35	106.94	3 rd year of middle school, 1 st and 2 nd year of high school	15.66
Otis Gamma	2	112.00	1 st and 2 nd year of high school	16.17
Fluid intelligence test	42	4.27 out of 13 points	Follow up study (64-76 years old)	69.24
Spanish WAT	42	26.88 out of 30 points	Follow up study (64-76 years old)	69.24
WAT-Chicago	42	37.26 out of 40 points	Follow up study (64-76 years old)	69.24

Table 1. Names, sample sizes, means and school years/ages of administration of each IQ test used for this sample. The protocol for the longitudinal study, particularly in the early years, saw changes from one year to the next.

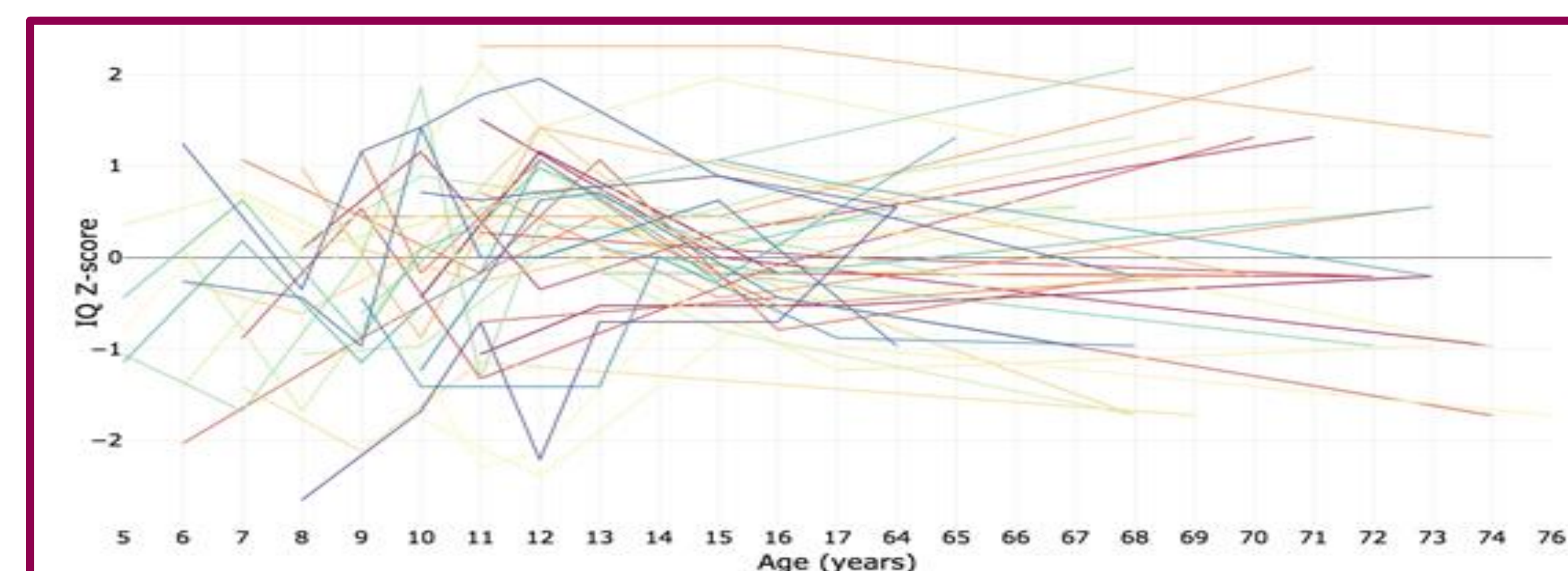


Figure 3. IQ Z-scores by age and ID

Conclusions

- Test type, motivation, and disturbing life experiences could in part explain the within subject variance in scores.
- These sources of variability, plus modest association between childhood and older age IQ scores suggest that single point measurements of intelligence at a young age and stability of test scores over lifespan should be regarded with some caution.

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