

Are demographics our destiny? Examining individual differences in Canadian children's intelligence Scores



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ABSTRACT

Intelligence is a complex construct, therefore examining individual differences is crucial to our understanding of its expression. In part one, we examined the impact of parent education level and ethnicity on IQ performance differences on the WISC-V^{CDN}. We illustrated significant differences in performance based on these variables in the Canadian sample. The purpose of part two is to extend these findings, mirroring in-depth analyses conducted in the U.S. within our Canadian sample. Demographic factors and WISC-V^{CDN} scores from the standardization sample (N=880) will be analyzed using regression modelling, and a mediation hypothesis will be explored. The hypothesis is that SES will partially mediate the ethnicity differences in intelligence test performance. This study is not focused on direct examinations of IQ differences based on one variable, rather, its focus is the dynamic associations between individual differences. Given the observable group differences uncovered in the initial analyses, we want to examine *why* these differences might exist and discuss important concerns regarding equal access to education. The WISC-V^{CDN} is used across Canada by clinicians, therefore giving context to the interpretation of results only serves to strengthen the conclusions, allowing Canadian children to have the best chance to succeed.

BACKGROUND

- Intelligence is a powerful correlate of human behaviours and characteristics & has an important impact life outcomes: educational & career success, mental health, & longevity.^{1,2}
- Given the many influences, it is imperative that intelligence tests are interpreted accurately.
- Intelligence does not exist in isolation; culture, nurturing, & home environment play key roles in the development and expression of intelligence.^{3,4,5}
- Weiss et al. conducted an examination of the influence of demographics on WISC-V test performance.⁶
- Findings revealed differential performance in IQ test scores based on factors like ethnicity, parent education level & household income.⁶

PURPOSE & RATIONALE

- The purpose was to examine the influence of demographic differences on intelligence scores of Canadian children using the WISC-V Canadian standardization sample.
- Extensive research examining the societal context of demographic differences in U.S. population. However, there is little evaluation within Canada.
- Given the widespread use of the WISC-V^{CDN} across the country, the results are not only important for interpretation of scores, but also provide valuable insight for psychological & education communities.

METHODOLOGY

Participants:

- 880 Canadian children
- English first-language
- Sample Stratification – 5 variables:
 - Sex (Male, Female)
 - Age (6–16)
 - Ethnicity (Asian, Caucasian, First Nations, & Other)
 - Parent Education Level (1–4)
 - Geographic Region (West, East, or Central Canada)
- Stratified to **2011 National Household Survey**⁷
- Inclusion of participants with disabilities & special education status
- Stratification imperative to ensure the Canadian population appropriately represented

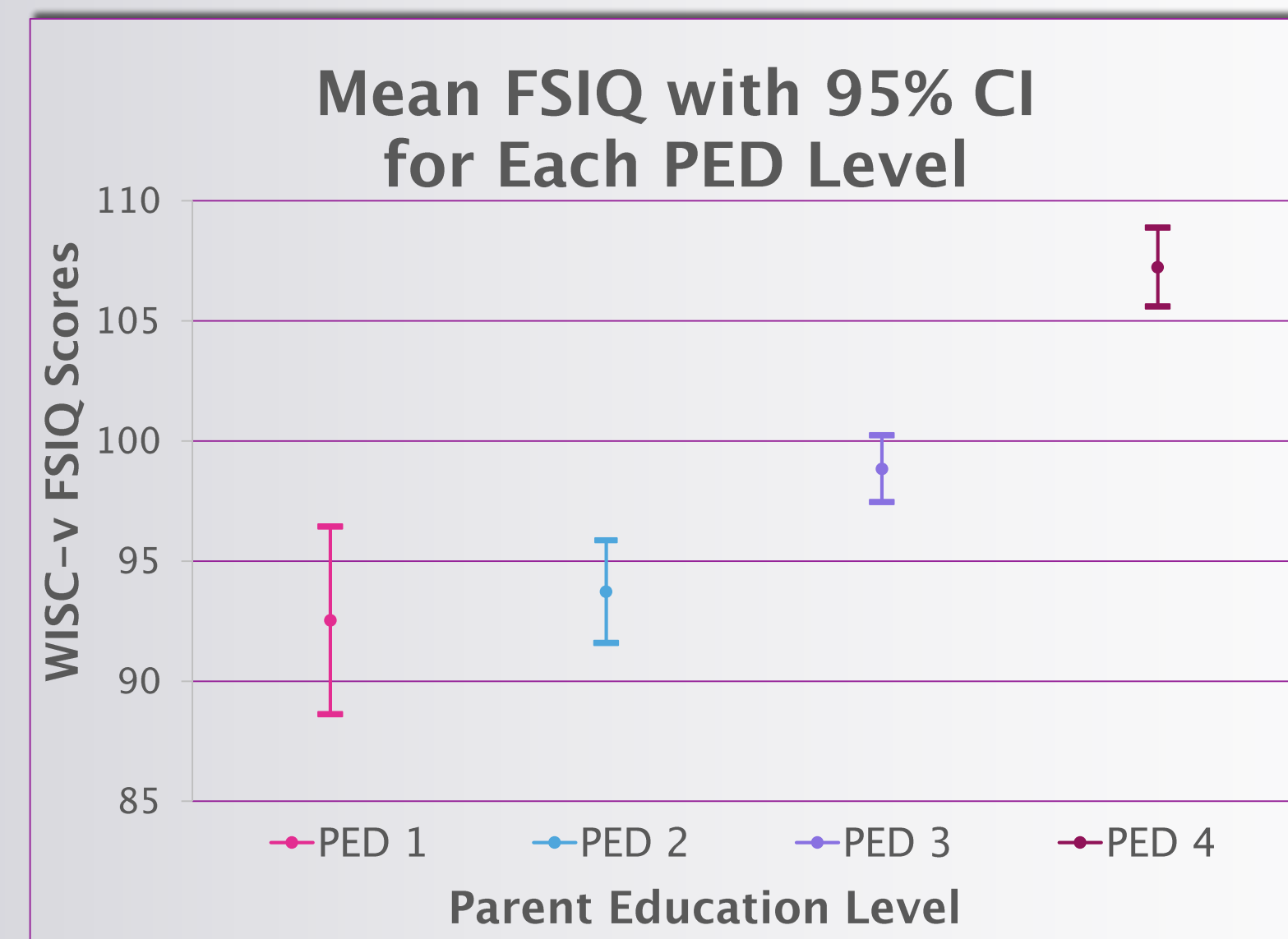
Materials

- Wechsler Intelligence Scale for Children – Fifth Edition: Canadian (WISC-V^{CDN})**
 - Variable: Full Scale IQ
- Home Environment Questionnaire**
 - Variables: Ethnicity, Parent Education Level & Income

Procedure:

- All data collected in the Canadian Standardization study
- Children were administered the full WISC-V^{CDN} assessment by a trained examiner
- Parents completed Home Environment Questionnaire

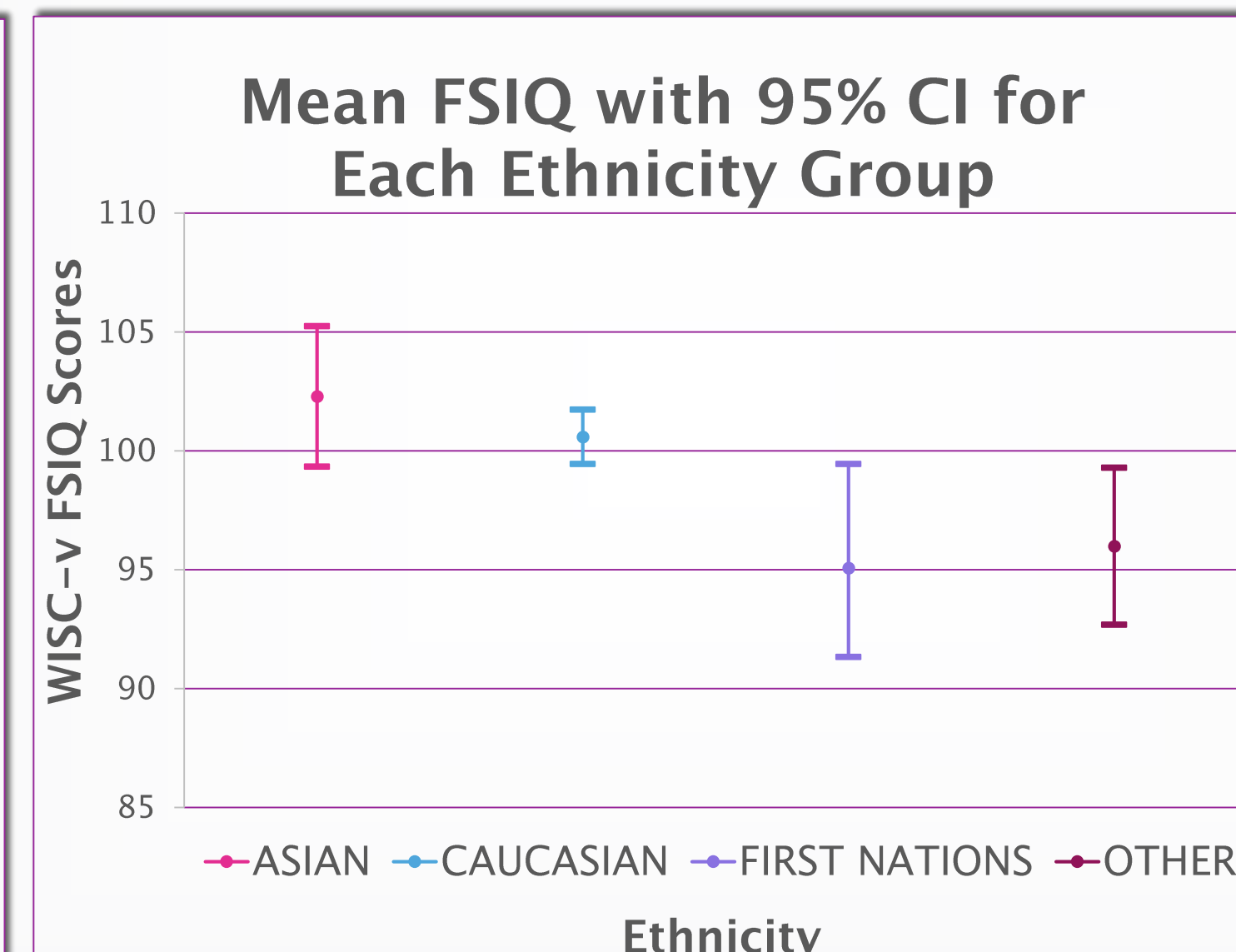
RESULTS



One Way ANOVA: $F(3,876) = 42.58, p < .001; \eta^2 = .13, \text{power} = 1.00.$

Tukey HSD test ($\alpha = .05$):

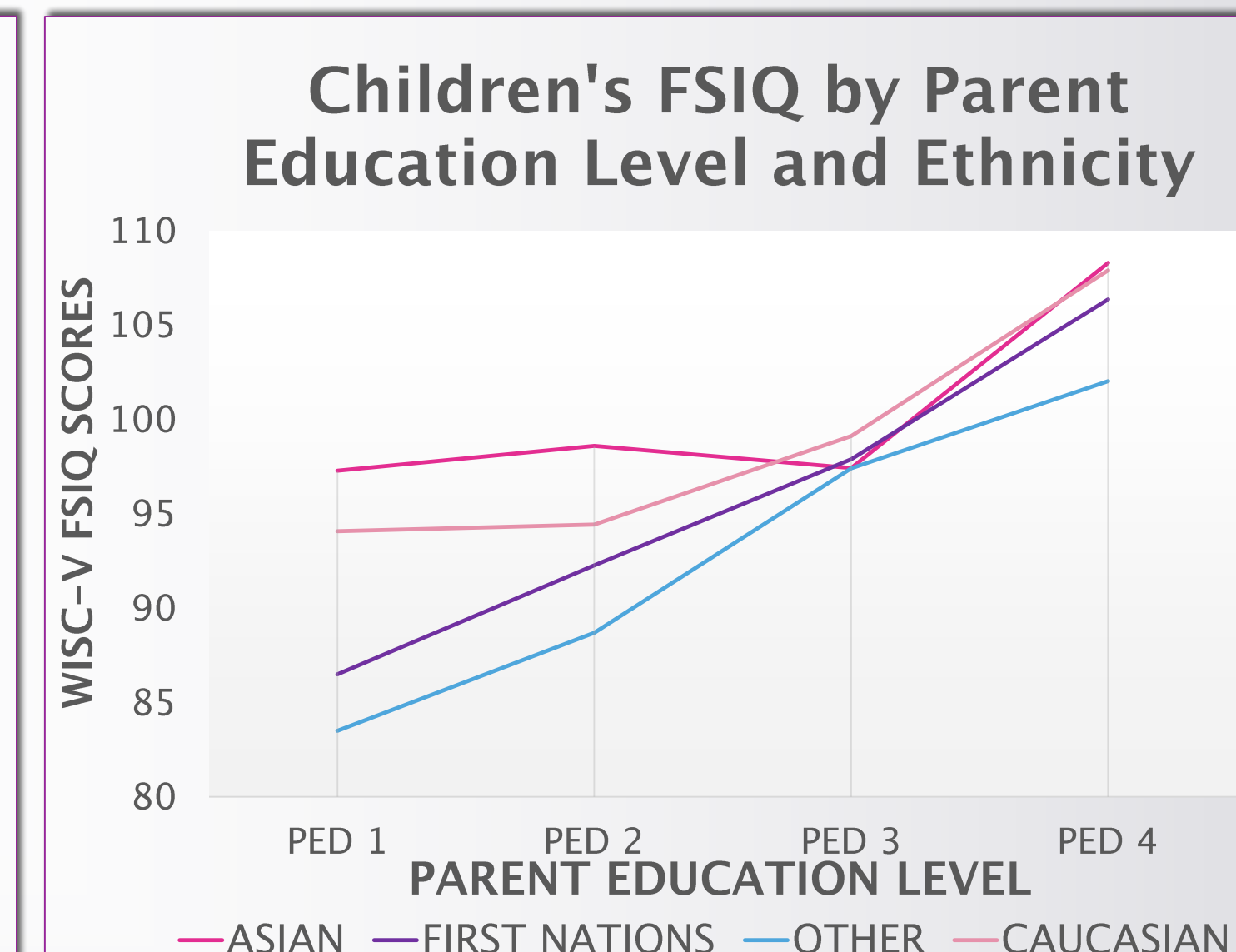
- PED 1 scored lower than PED 3* & 4**
 - PED 2 scored lower than PED 3 & 4**
 - PED 3 scored higher than PED 1* & PED 2** & lower than PED 4**
 - PED 4 scored higher than PED 1, 2, & 3**
- * = ($p \leq .05$), ** = ($p < .001$)



One Way ANOVA: $F(3,876) = 5.25, p = .001; \eta^2 = .02, \text{power} = .93.$

Tukey HSD test ($\alpha = .05$):

- Asian & Caucasian groups scored higher than First Nations & Other groups ($p \leq .05$).
- No observed differences between the Asian & Caucasian groups ($p = .718$) or the First Nations & Other groups ($p = .984$).



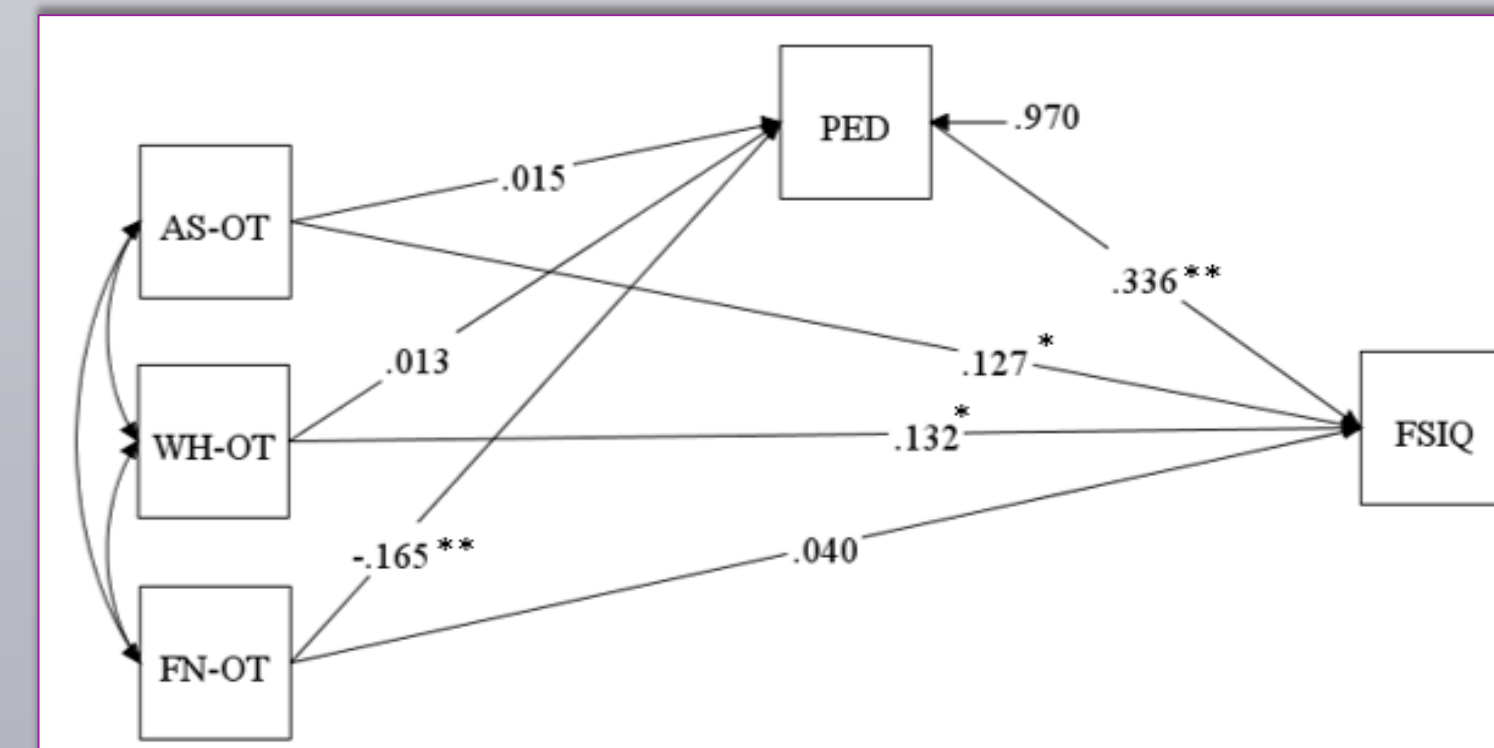
- This interaction was not significant. Power = .293, well below suggested 80%. This likely a result of unbalanced sample sizes.
- Differences observed in PED 1 between the highest & lowest ethnicity means (13.73).
- Post-hoc analysis specifically within the PED 1 group. The ANOVA again was not significant; $F(3, 47) = 2.125, p = .110; \eta^2 = .119, \text{power} = .508.$

Summary of standard regression analysis to predict FSIQ from Ethnicity, Parent Education, and Income

	ΔR^2	<i>b</i>	<i>SE^b</i>	<i>t</i>	<i>Sig.</i>
Model 1	.022	96.58	2.05	47.05	.000
Model 2	.096	80.08	2.71	29.51	.000
Model 3	.014	78.55	2.73	28.76	.000

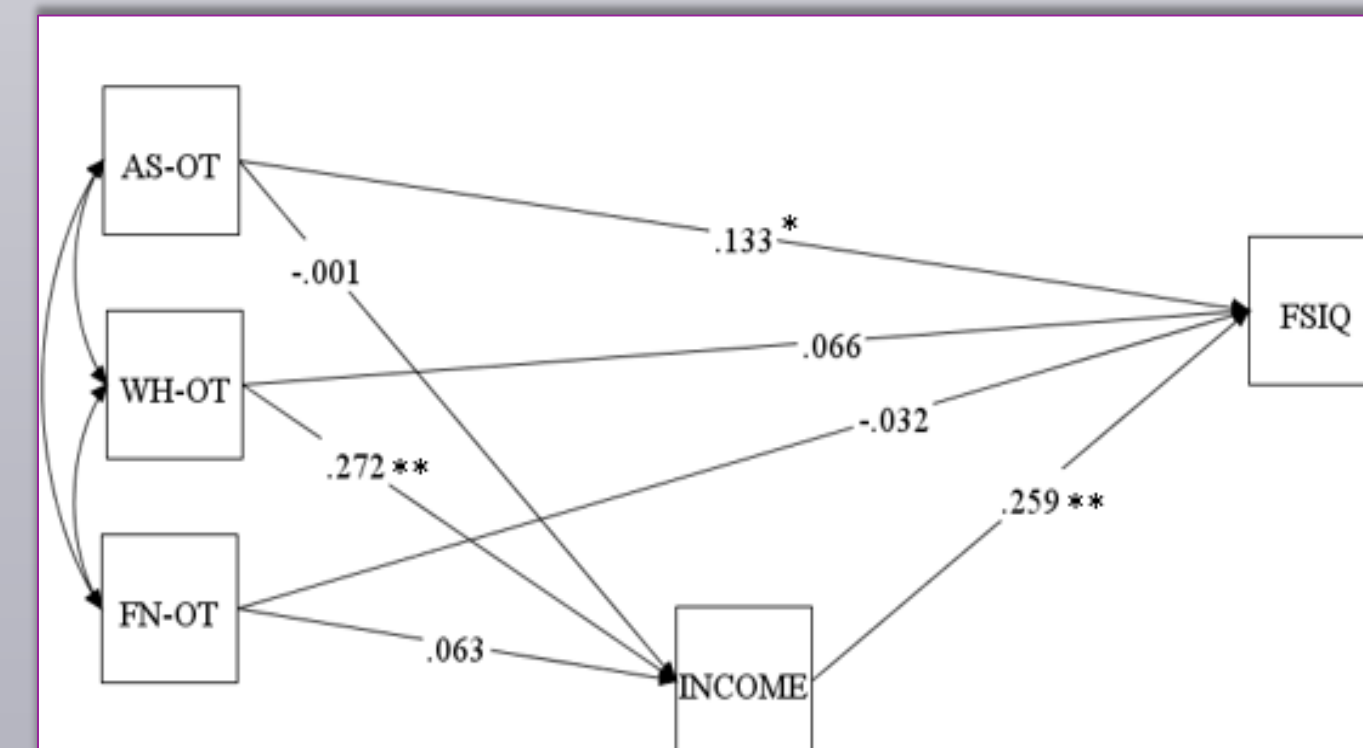
Note. Model 1: Ethnicity only. Model 2: Addition of PED. Model 3: Addition of Income.

PED as a mediator



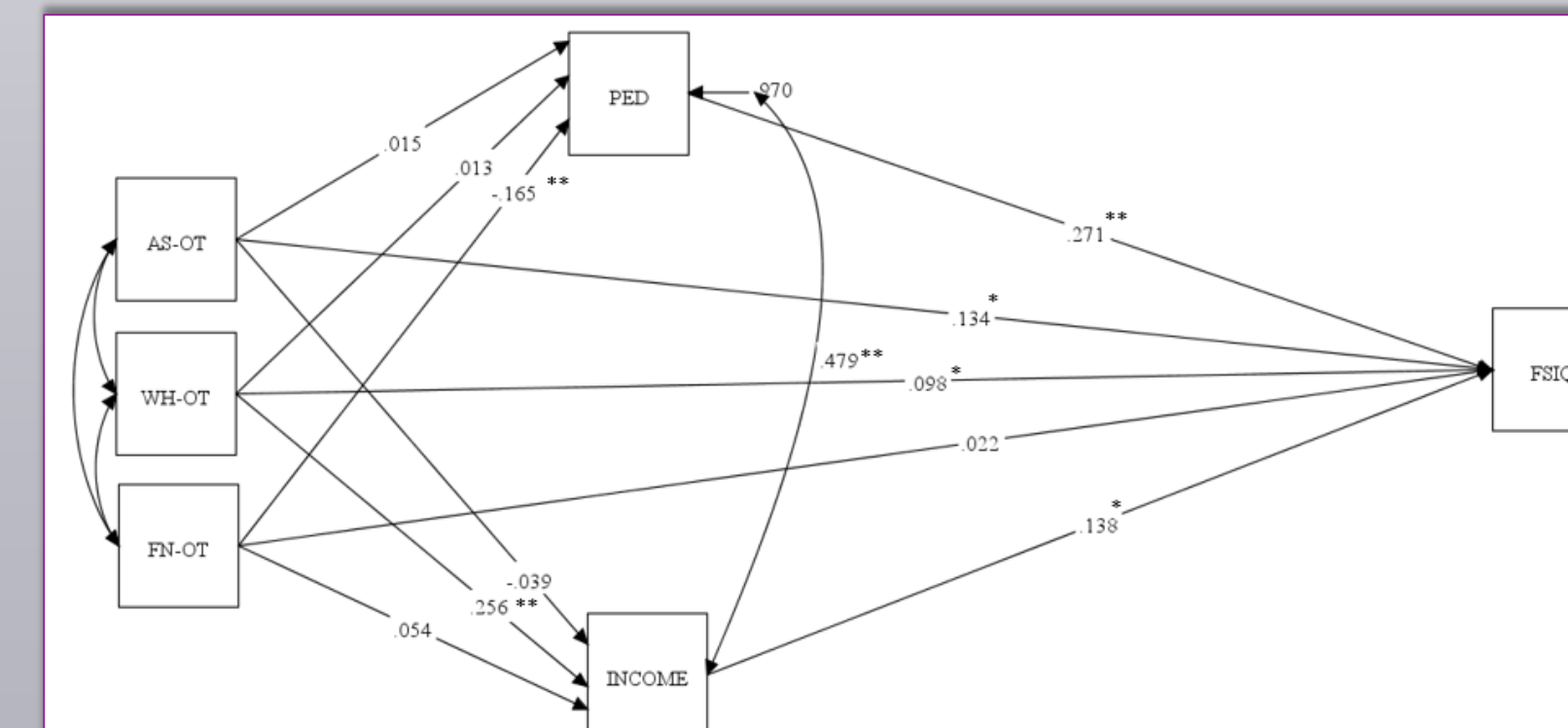
All are standardized coefficients. ** $p < .001$, * $p < .05$. Specific indirect effects include AS-OT: $b = .005, p = .794$; WH-OT: $b = .004, p = .834$; FN-OT: $b = -.055, p = .001$. Total effects include AS-OT: $b = .177, p = .004$; WH-OT: $b = .136, p = .006$; FN-OT: $b = -.015, p = .703$

Income as a mediator



All are standardized coefficients. ** $p < .001$, * $p < .05$. Specific indirect effects include AS-OT: $b = .001, p = .984$; WH-OT: $b = .070, p = .001$; FN-OT: $b = .016, p = .286$. Total effects include AS-OT: $b = .132, p = .004$; WH-OT: $b = .136, p = .006$; FN-OT: $b = .131, p = .703$.

PED and Income as mediators



All are standardized coefficients. ** $p < .001$, * $p < .05$. Indirect effects include AS-OT: $b = -.001, p = .949$; WH-OT: $b = .039, p = .106$; FN-OT: $b = -.037, p < .05$. Total effects include AS-OT: $b = .132, p = .003$; WH-OT: $b = .136, p = .003$; FN-OT: $b = .131, p = .444$.

CONCLUSIONS

- Consistent with U.S. findings:
 - Significant differences observed as a function of Parent Education Level; higher level resulted in higher mean FSIQ in children.
 - Significant differences observed as a function of Ethnicity, some groups performed better, which is *not* a result of test bias.
 - Ethnicity, PED & income all predictors of FSIQ.
- Hypothesized interaction effect not observed, but strong effect size was.
- Suggests need for oversample for adequate power.
- Adding in SES variables accounts for significantly more variance than ethnicity.
- Preliminary evidence that SES acts as a mediator in the observed relationship between ethnicity and FSIQ.

IMPLICATIONS

- Regardless of ethnicity, higher education & increased environmental opportunity yields higher performance.
- Highlights issues regarding access to education & promoting support in at-risk communities.
- It is critical that these findings are considered at the policy levels which in turn supports access to the most effective environments.
- This enables us to provide necessary support to promote healthy cognitive development in children across all ethnicities, abilities, & social status.

FUTURE DIRECTIONS

- Inclusion of all groups of Indigenous peoples of Canada (Métis, Inuit)
- Increase representation of disabilities sample
- Oversampling of certain ethnicity and parent education groups to allow for interaction effect to be tested
- Examine the influence of parental support and encouragement as potential protective barrier
- Examine the influence of linguistic diversity as a potential variable driving ethnicity differences

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