Can the Early Development Instrument (EDI) be used to explore social determinants of health for children with special needs?

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Background

Early Childhood Development

- Children with special needs often face poor developmental outcomes, which translate to poor academic and social outcomes later in life.

Early childhood experiences → Child development → Academic outcomes / Social outcomes

- There is evidence that certain factors can mitigate or exasperate these outcomes.

- Population-level monitoring of developmental health for children with special needs is important as it can shed light on correlates of developmental outcomes.

The Early Development Instrument (EDI)

- The Early Development Instrument (EDI) is a teacher-completed instrument to evaluate children's developmental health at school entry across five domains (each scored on a 0 to 10 scale):
  - physical health & wellbeing
  - social competence,
  - emotional maturity,
  - language & cognitive development,
  - communication skills & general knowledge

- The EDI has undergone extensive validation in typically developing populations.

- **Objective:** To investigate psychometric properties of the EDI in a Canadian population of children with special needs.

Methods

- The Pan-Canadian database on children's developmental health, which includes EDI records from all provincial implementations of the EDI, was used for this investigation.

- Item and domain performance were evaluated by item-total domain score correlation, item-deleted alpha, and domain alpha coefficients.

- The fit of the five factor model of the EDI was evaluated by confirmatory factor analysis (CFA).

- Multivariate analysis of covariance (MANCOVA) was conducted to assess the sensitivity of the EDI to gender and age.

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Results

- Population characteristics are presented in table 1.

Table 1: Population characteristics	
Total N	29,841
Gender	
Male *n* (%)	20,809 (69.8)
Female *n* (%)	9,003 (30.2)
Age	
Mean age (SD)	5.79 (0.42)

Item and Domain Characteristics

- Mean EDI domain scores for children in the study were lower than those for typically developing children in the EDI normative dataset, with large differences (Table 2).

- Domain alpha coefficients were higher than ideal but similar to those obtained for typically developing children (Table 2).

- Only three items were found to be potentially problematic due to lack of homogeneity with other items in their respective domains.

Table 2: EDI domain ordinal alpha coefficients and score distributions for children with special needs and typically developing children (normative data)										
	PHWB		**SC**		**EM**		**LCD**		**CSGK**	
	SN	TD	SN	TD	SN	TD	SN	TD	SN	TD
Ordinal alpha	0.88	0.84	0.98	0.96	0.95	0.92	0.98	0.93	0.96	0.95
Mean (SD)	6.86 (2.10)	8.80 (1.30)	5.46 (2.55)	8.32 (1.79)	5.95 (1.94)	8.04 (1.49)	5.95 (3.01)	8.45 (1.78)	4.05 (3.15)	7.65 (2.55)
Effect size (Cohen's d)	0.81		1.30		1.21		1.01		1.26	

PHWB: Physical health & wellbeing; SC: Social competence; EM: Emotional maturity; LC: Language & cognitive abilities; CSGK: Communication skills & general knowledge; SN: Special needs; TD: Typically developing

Confirmatory Factor Analysis (CFA)

- The fit of the factor structure of the EDI in children with special needs (Table 3) was found to be better than that observed in typically developing children (Janus et al., 2011).

Table 3: Confirmatory Factor Analysis (CFA) goodness-of-fit statistics			
Domains	CFI	TLI	RMSEA (90% CI)
PHWB	0.977	0.973	0.112 (0.110-0.113)
SC	0.978	0.976	0.156 (0.156-0.157)
EM	0.901	0.893	0.229 (0.229-0.230)
LCD	0.988	0.987	0.083 (0.082-0.083)
CSGK	0.997	0.996	0.091 (0.089-0.093)
Five Factor Model	0.953	0.952	0.111 (0.111-0.111)

Mean and Variance Adjusted Weighted Least Squares: WLSMV; Comparative fit index: CFI; Tucker-Lewis index: TLI; Root mean square error of approximation: RMSEA; PHWB: Physical health & wellbeing; SC: Social competence; EM: Emotional maturity; LC: Language & cognitive abilities; CSGK: Communication skills & general knowledge; SN: Special needs;
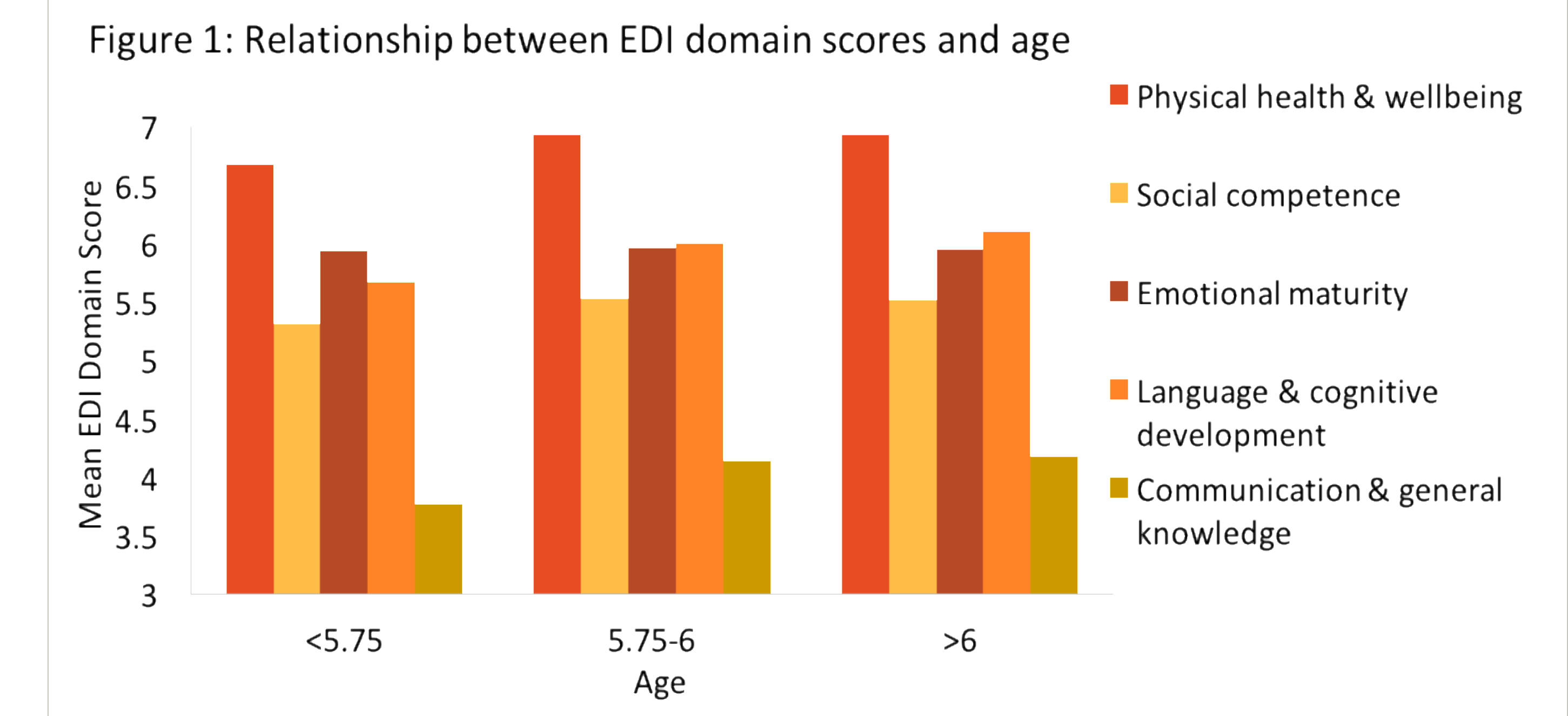
Construct Validation

- Similar to typically developing populations, girls with special needs scored significantly higher on all domains of the EDI (Table 4).

- Only the emotional maturity domain was sensitive to age ($F_{(1,29111)}$, p=0.002).

Table 4: Mean (SD) domain scores of the Early Development Instrument (EDI) for girls and boys		
Domain	Boys	Girls
Physical health & wellbeing	6.83 (2.05)	6.93 (2.21)
Social competence	5.21 (2.46)	6.03 (2.67)
Emotional maturity	5.68 (1.88)	6.58 (1.92)
Language & cognitive abilities	5.92 (2.97)	6.02 (3.12)
Communication skills & general knowledge	3.92 (3.07)	4.36 (3.31)

All statistically significant at p<0.005

Figure 1: Relationship between EDI domain scores and age
(Legend: Physical health & wellbeing; Social competence; Emotional maturity; Language & cognitive development; Communication & general knowledge. X-axis: Age <5.75, 5.75-6, >6; Y-axis: Mean EDI Domain Score)

Discussion

- Overall, the performance of the EDI children with special needs was similar to its performance in typically developing children.

- Only minor issues were observed, such as lack of homogeneity between few items and their respective domains.

- The statistically insignificant relationship between EDI scores and age was not unexpected, as many developmental assessment scores do not show significant improvement with age for children with disabilities (e.g., Patterson et al., 2013; Rapport et al., 1994).

- The evidence presented here supports the validity of EDI data in this population, thus enabling pediatric and education population-level research on all children's development at school entry.