

DEVELOPMENT OF THE SHORT  
EARLY DEVELOPMENT  
INSTRUMENT  
(S-EDI)

by

M. Janus, PhD & E.K. Duku, MSc, P.Stat

Offord Centre for Child Studies,  
Department of Psychiatry and Behavioural  
Neurosciences,  
McMaster University,  
Hamilton, ON L8N 3Z5  
CANADA

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## **Introduction**

The Early Development Instrument was developed by Dan Offord and Magdalena Janus at the Offord Centre for Child Studies, McMaster University in 1998, and finalized in 2000 (Janus & Offord, 2000) with support of a national advisory committee. It is largely based on the National Longitudinal Survey of Children and Youth (NLSCY) and other existing developmental tests. Between 1998/99 and 2003/04 it has been implemented with over 290,000 students nation-wide.

The purpose of the EDI is to report on populations of children in different communities. It is intended to help communities assess how well they are doing in supporting young children and their families and assist in monitoring changes. The instrument is completed by the kindergarten teachers in the second half of a school year. The EDI was designed primarily for use with whole populations of children (based on geographical or administrative boundaries) and cannot be interpreted at an individual level for a diagnostic purpose.

The EDI is a 104-question checklist measuring children's readiness to learn at school before entry to Grade 1. The EDI measures children's readiness to learn at school in five general domains identified in the literature: physical health and well-being, social competence, emotional maturity, language and cognitive development, and communication and general knowledge. The instrument also collects information on child demographic variables as well as variables related to the child's school based designation, such as English as a Second Language (ESL), Special Needs (SN) and other pre-school variables.

In December 2004, the Offord Centre for Child Studies undertook the task of developing a shorter version of the EDI (S-EDI) for community use around the world.

## **Data**

Since 1999 EDI data has been collected for over 200,000 4-5 year old children in Canada and beyond. This provided a set of normative data on the EDI based on a community-representative subgroup of the current database collected over the past five years in Canada.

Data for children selected for the Canadian normative sample were based on the following criteria:

- (a) children had to be in SK;
- (b) for every community, it had to be their most recent and most comprehensive implementation;
- (c) the gender had to be known for all children;
- (d) the age had to be known for all children and had to be in the appropriate age range
- (e) children couldn't be missing more than 1 domain score; and
- (f) children were not classified as "special needs".

It should be noted the using the criteria (f) meant that communities for whom the latest or most comprehensive implementations was the 1999/2000 academic year were excluded since the "special needs" status was not collected systematically until the 2000/01 academic year. The only region/territory/province thus excluded was Nunavut (N=104)

## **Statistical Methodology**

The first step of the analyses involved validating the 16 subscales of the EDI using the Canadian normative sample using factor analysis and Cronbach's alpha, a test of internal consistency. The purpose of the factor analysis is to discover simple patterns in the pattern of relationships among the questionnaire items. In particular, it seeks to discover if the observed items can be explained largely or entirely in terms of a much smaller number of variables or constructs called factors. Cronbach's alpha which is a coefficient of reliability or consistency is used to determine how well sets of items (or variables) measure single one-dimensional latent constructs. When data have a multidimensional structure, Cronbach's alpha will usually be low. The 16 subscales were

constructed from the 104 items and are presented in elsewhere in another article along with their loadings and the items, as well as Cronbach's alpha for each subscale. (Janus & Duku 2005)

The next step involved identifying the top 3 items in each subscale based on their loadings. These were used to form the items in the shortened sub-domains. A limitation of this selection method is that it leads to the retention of items for which responses are highly correlated or have similar difficulties. It is therefore important to have experts' assessment to ensure impartiality and representativeness and to limit information bias (Coste et al, 1997).

Using factor analyses and testing for internal consistency using Cronbach's alpha, the domains based on the fewer items were tested for uni-dimensionality using data from Seattle, WA and Perth, Australia as validation samples. For comparability, the samples were selected using the same criteria as for the Canadian gold standard sample.

The longer version of the EDI was used as the gold standard to test the construct validity and accuracy of the shortened instrument (Coste et al, 1997).

## **DOMAINS, SUB-DOMAINS AND MEASURES**

The five domains and 16 sub-domains of the EDI are:

**(1) Physical health and well-being** which includes: gross and fine motor skills, holding a pencil, running on the playground, motor coordination, adequate energy levels for classroom activities, independence in looking after own needs, and daily living skills.

The 3 subscales are:

- (a) Gross and fine motor skills:** Ability to perform skills requiring gross and fine motor competence, and ability to sustain energy level during the school day;
- (b) Physical readiness for school day:** Physical preparedness for active participation in school activities: being dressed appropriately, coming to school on time, not hungry or tired;
- (c) Physical independence:** Self-hygiene, independence, handedness, coordination and signs of dependence, like finger-sucking.

**(2) Social competence** includes: curiosity about the world, eagerness to try new experiences, knowledge of standards of acceptable behaviour in a public place, ability to control own behaviour, appropriate respect for adult authority, cooperation with others, following rules, and ability to play and work with other children.

The subscales are:

- (a) Overall social competence:** Overall social skills, self-confidence, ability to get along with various children;
- (b) Responsibility and respect:** Respect for others and for property, shown by self-control, following rules, taking care of materials, and accepting responsibility for actions;
- (c) Approaches to learning:** Working habits and problem-solving abilities, ability to adjust to class routines;
- (d) Readiness to explore new things:** Curiosity and eagerness to explore new toys, books, and games.

**(3) Emotional maturity** includes: ability to reflect before acting, a balance between too fearful and too impulsive, ability to deal with feelings at the age-appropriate level, and empathic response to other people's feelings.

Subscales of emotional maturity are:

- (a) Prosocial and helping behaviour:** basic empathy and willingness to help others who may need assistance or encouragement;
- (b) Hyperactivity and inattention:** restlessness and distractibility, inability to Concentrate;
- (c) Anxious and fearful behaviour:** anxiety, excessive crying, sadness, and fearfulness, lack of comfort with school;
- (d) Aggressive behaviour:** physical and non-physical aggression and disobedience.

**(4) Language and cognitive development** includes: reading awareness, age-appropriate reading and writing skills, age-appropriate numeracy skills, board games, ability to understand similarities and differences, and ability to recite back specific pieces of information from memory.

The subscales are:

- (a) **Basic literacy skills:** basic abilities to recognize written words and to participate in literacy-oriented play;
- (b) **Interest literacy/numeracy and memory:** interest in participating in literacy and numeracy-oriented activities;
- (c) **Advanced literacy skills:** reading and writing;
- (c) **Basic numeracy skills:** number recognition and counting, comfort with basic mathematical concepts.

(5) **Communication and general knowledge** includes: skills to communicate needs and wants in socially appropriate ways, symbolic use of language, story telling, and age-appropriate knowledge about the life and world around. This is the only domain without only subscale.

Two summary measures used for vulnerability used in the report are:

(a) **Vulnerability (percentage low on one or more domains)** is a summary measure of the number of domains out of five that a child scores below the lowest 10<sup>th</sup> percentile. This measure is dependent on the distributions of the domains in the community/sample.

(b) the **Multiple Challenge Index** is a summary indicator of vulnerability. It is based on absolute numbers and is not dependent on the distributions of the domains in a community/sample. The MCI is scored based on challenges in 9 or more sub-domains out of 16, and is expressed as “existence of multiple challenges” (1), or “no multiple challenges” (0). A child classified as “multiply challenged” is scoring low in at least 3 of the 5 domains.

The full version of the EDI used is presented in Appendix 1.

## **Results**

Descriptive statistics for the Canadian normative sample are presented in Table 1. There were 116,860 children in the sample, 49% males with a mean age of 5.69 years. The provinces represented were British Columbia, Manitoba, Ontario, Saskatchewan, New Brunswick, Quebec, Newfoundland, Prince Edward Island, Alberta and Nova Scotia.

Analyzing the inter-correlations between the 5 domains of the EDI shows that the magnitude of the correlations was between 0.45 and 0.80. Table 3 displays the means and percentile cut-offs for the domains of the EDI. As is usually observed across communities, the mean score for the physical health and well-being domain is the highest and the mean score for the communications and general knowledge domain is the lowest.

Table 4 shows the correlations of the sub-domains with the full domain scores as well as the correlations of the S-EDI sub-domains with the EDI sub-domains. As can be observed the correlations vary between 0.80 and 0.97. The items in the S-EDI are presented in Appendix II.

Next, the reliability of the domain scores computed using the 3-item per subscale for the S-EDI was explored. Using data from Seattle, WA and Perth, Australia as validation samples, the reliability of the domain scores was tested. Table 5, shows that the magnitude of Cronbach's alpha statistic for the domains of the S-EDI is of similar magnitude across the samples.

The full EDI was used as the gold standard to test the construct validity and accuracy of the S-EDI. Accuracy of the vulnerability classification (low on one or more EDI domains) assessed with both the full and short was compared and presented in Table 7. The probability of correctly identifying a child as vulnerable with the short version is 81.9% and the probably of correctly identifying the children who are not vulnerable is 97.2%. Thus the vulnerability measure from the S-EDI is as good a measure of school readiness as the vulnerability measure from the full EDI.

## **Conclusion**

Based on the analysis reported here the S-EDI is ready to use in a community context. However, it must be noted that a number of future steps have to be undertaken to fully explore its psychometric properties.

These include:

- (a) testing the short EDI and validating it in different cultural settings;
- (b) checking for construct validity using a panel of experts
- (c) test-retest reliability
- (d) predictive validity – using other child behavioural measures
- (e) using Item Response Theory to test the instrument's suitability
- (f) composite score or measure using a one factor congeneric model which takes into account measurement error.

It is also recommended that a cultural validity consultation be held before the S-EDI is implemented. In some cases, the factor loadings for the three “top” items chosen were close to items that were not chosen. Hence there is room for changes.

## References:

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**Table 1. Demographic Characteristics of the Canadian Normative Sample**

<b>Characteristic</b>	<b>Category</b>	<b>n</b>	<b>%</b>
<b>Province/Territory</b>	British Columbia	34,023	29.1
	Manitoba	7,489	6.4
	Ontario	65,616	56.1
	Saskatchewan	3,316	2.8
	New Brunswick	957	0.8
	Quebec	1,424	1.2
	Newfoundland	223	0.2
	PEI	1,163	1.0
	Alberta	2,454	2.1
	Nova Scotia	195	0.2
	Nunavut	--	--
<b>Gender</b>	Girls	57,562	49.3
	Boys	59,298	50.7
<b>Age category*</b>	< 4-11	68	0.1
	4-11 to 5-1	829	0.7
	5-2 to 5-4	20,319	17.4
	5-5 to 5-7	29,117	24.9
	5-8 to 5-10	30,398	26.0
	5-11 to 6-1	28,175	24.1
	6-2 to 6-4	7,282	6.2
	> 6-4	672	0.6

\* Months were rounded down for ages less than 15 days, and up for more than 15 days. That means that children aged less than 6 years 1.5 months belong to the 5-11 to 6-1 category, and children aged from 5 years 1.5 months to 5 years 4.5 months belong to the 5-2 to 5-4 category.

**Table 2. Correlations between domains for Canadian Normative Sample**

	<b>Social competence</b>	<b>Emotional maturity</b>	<b>Language and cognitive development</b>	<b>Communication and general knowledge</b>
<b>Physical health and well-being</b>	0.590	0.488	0.528	0.607
<b>Social competence</b>		0.799	0.587	0.572
<b>Emotional maturity</b>			0.457	0.449
<b>Language and cognitive development</b>				0.621

**Table 3. EDI domain statistics for Canadian Normative Sample**

<b>EDI Domains</b>	<b>Valid N</b>	<b>Mean</b>	<b>SD</b>	<b>PERCENTILES</b>				
				<b>90</b>	<b>75</b>	<b>50</b>	<b>25</b>	<b>10</b>
<b>Physical health and well-being</b>	116,512	8.79	1.05	10.00	9.62	9.04	8.27	7.31
<b>Social competence</b>	116,817	8.29	1.74	10.00	9.62	8.85	7.31	5.58
<b>Emotional maturity</b>	115,739	8.05	1.51	9.83	9.17	8.33	7.17	6.00
<b>Language and cognitive development</b>	116,200	8.36	1.82	10.00	9.62	8.85	7.69	5.77
<b>Communication and general knowledge</b>	116,794	7.73	1.94	10.00	9.44	8.06	6.39	5.00

**Table 4.**

<b>Domain &amp; Sub-domains</b>	<b>correlation of S-EDI domains with EDI domains</b>	<b>correlation of S-EDI subscales with EDI subscales</b>
<b>physical health and well-being</b>	0.967	
Gross and fine motor skills		0.873
Physical readiness for school day		0.873
Physical independence		0.973
<b>social competence</b>	0.964	
Overall social competence		0.933
Responsibility and respect		0.885
Approaches to learning		0.904
Readiness to explore new things		0.943
<b>emotional maturity</b>	0.954	
Prosocial and helping behaviour		0.938
Anxious and fearful behaviour		0.799
Aggressive behaviour		0.825
Hyperactivity and inattention		0.894
<b>language and cognitive development</b>	0.940	
Basic literacy skills		0.795
Interest literacy/numeracy and memory		0.881
Advanced literacy skills		0.925
Basic numeracy skills		0.921
<b>communication and general knowledge</b>	0.964	0.966

**Table 5. Reliability of reduced item domains across different cultural samples of the Short-EDI**

<b>Domain &amp; Sub-domains</b>	<b>Canada</b>	<b>Seattle, WA</b>	<b>Perth, Australia</b>
<b>physical health and well-being</b>	0.766	0.745	0.748
<b>social competence</b>	0.905	0.916	0.890
<b>emotional maturity</b>	0.836	0.841	0.838
<b>language and cognitive development</b>	0.856	0.829	0.842
<b>communication and general knowledge</b>	0.939	0.936	0.893

**Table 6. S-EDI domain statistics for Canadian Normative Sample**

<b>EDI Domains</b>	<b>Valid N</b>	<b>Mean</b>	<b>SD</b>	<b>PERCENTILES</b>				
				<b>90</b>	<b>75</b>	<b>50</b>	<b>25</b>	<b>10</b>
<b>Physical health and well-being</b>	116,027	8.96	1.02	10.00	9.72	9.17	8.44	7.50
<b>Social competence</b>	116,796	8.32	1.74	10.00	9.58	8.96	7.29	5.83
<b>Emotional maturity</b>	116,486	8.09	1.64	10.00	9.17	8.33	7.08	5.83
<b>Language and cognitive development</b>	115,861	8.22	2.22	10.00	10.00	9.17	7.50	5.00
<b>Communication and general knowledge</b>	116,771	7.26	2.36	10.00	10.00	7.50	5.83	4.17

**Table 7. Accuracy of vulnerability (% low on at least one domain) based on the S-EDI across samples.**

<b>measure</b>	<b>Canadian normative sample</b>
<b>Sensitivity</b>	81.9%
<b>Specificity</b>	97.2%
<b>Positive Predictive Value</b>	92.3%
<b>Negative Predictive Value</b>	92.9%