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STRENGTHENING SOCIAL AND EMOTIONAL HEALTH

Children's Institute Early Cognitive Kindergarten Parent-Reported Screening Instrument (CI-ECKPSI): A two item parent-reported indicator that predicts academic performance 5 years later.

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Purpose and objectives: The purpose of this brief technical report is to describe the technical psychometric properties of the Children's Institute Early Cognitive Kindergarten Parent-Reported Screening Instrument (CI – ECKPSI). The ECKPSI is a very brief parent report, a set of two questions that can be used by school districts to identify students entering kindergarten that are likely to need academic intervention.

The objectives of the project were:

(a) To make the measure as short as possible, so as to reduce district's and parent's costs in obtaining the information.
(b) To ensure that the measure had an alpha reliability above .70, which is typically acceptable for screening measures.
(c) To ensure that the measure could assess the low end of the early cognitive continuum, thus ceiling effects are expected for this type of construct.
(d) To ensure that the measure is positively correlated with 4th grade English Language Arts and Mathematics New York State Assessments for the urban population.

Sample: The sample was obtained from a medium-sized city in upstate New York. At their children's registration prior to entry into kindergarten, parents or caregivers completed the Parent Appraisal of Children's Experiences (K-PACE), a screening instrument that assesses multiple domains. In 2004-05, 1,726 kindergarten PACEs were completed. After removal of forms that could not be matched with school district registration records, e.g., because of malformed identifiers, and duplicated records, 1,649 kindergarten students remained in the sample. In fourth grade, students completed NY State assessments of English Language Arts and Mathematics. Students could take the assessments later (e.g., because of retention) or, in rare cases, earlier, than the rest of the cohort, so test scores were obtained from the 2007-08 (N=7), 2008-09 (N=836), 2009-10 (N=323), and 2010-11 (N=11) school years, yielding 1,177 students who had both PACE and NYS ELA scores and 1,172 who had PACE and NYS Mathematics data. Of these, 30 students took the tests two consecutive years. After the second year's results were dropped, 1,147 students with ELA scores and 1,142 with Mathematics scores remained.

The final sample of students was 48% male, and 66% African-American, 21% Latino/Hispanic, and 15% White/not Hispanic. More than one race/ethnicity category could be selected.

Methods: Classical test analyses were used to identify the smallest collection of uni-dimensional items that targeted early cognitive functioning. Next, Rasch analyses were performed to ensure that items were well-ordered and fit the model. Predictive validity was estimated against 4th grade NY standardized test scores in Mathematics and English language Arts (ELA), as well as grade retention based on district data.

Results: The measure consisted of two items (in order of difficulty): "Does your child have difficulty remembering things?", and "Does your child have difficulty learning new things?".

- The overall alpha reliability of this 2 item measure was .91.
- All items have good infit and outfit mean square estimates (in the [.5, 1.5] range) and are close to expected values indicating good fit with the Rasch Andrich model.
- All items have categories that are progressively ordered.
- A table of norms is provided to convert raw scores from 2-8 to normed scale scores from 186 to 570.
- The measure is moderately correlated with 4th grade NY state Mathematics and English Language Arts scale scores.

- The measure is moderately correlated with having repeated a grade by 4th grade.
- As expected, the measure has ceiling effects.
- A cutoff was selected. Students below the cutoff were significantly at higher risk of academic failure five years later:
    - They were 2.5 times more likely to fail the ELA exam five years later.
    - They were 1.6 times more likely to fail mathematics state assessment.
    - They were 5 times more likely to score in level 1 in the ELA exam.
    - They were 3 times more likely to score in level 1 in the mathematics exam.
    - They were 1.8 times more likely to repeat a grade in the study period.

Conclusion: The CI-ECKSI is a short (2 item) parent-reported questionnaire that is highly reliable, well ordered and correlated with third party administered official test score data five years after the assessment took place and with grade retention in the five year period of time.

Students below its high-risk cutoff score were 60% more likely to fail the mathematics exam, and 2.5 times more likely to fail the ELA assessments five years later, as well as 85% more likely to repeat a grade in the study period.

School districts can use this brief instrument to provide parents with an opportunity to share their views of their child's cognitive functioning at entrance into kindergarten, and can use the information to screen children who likely need an intervention plan to improve academic outcomes in elementary school.

Because the information is obtained from parents, it is anticipated that parents would be happy to have a responsive school contact them about the needs they have expressed. The information in this report indicates that absent successful identification and intervention, students will be likely to fail academically by 4th grade.

Odds Ratios predicting academic failure for students below cutoff:

Table 1 shows the odds ratios and associated 95% confidence intervals.

Table 1. Odds of failing for students below cutoff score.

	n	OR	95% Confidence Interval	
Failing ELA	761	2.45**	1.61	3.74
Failing Mathematics	759	1.61*	1.04	2.49
ELA level 1	761	5.14**	2.62	10.12
Mathematics Level 1	759	3.13**	1.69	5.77
Repeating a grade	1022	1.85**	1.29	2.65

Note: OR odds ratio. * p<.05, **p<.01. Computation on ELA and mathematics only for students who did not repeat a grade.

Students who scored below cutoff were 2.45 times more likely to fail the ELA exam five years later, 1.61 times more likely to fail mathematics state assessment, 5.14 times more likely to score in level 1 in the ELA exam, and 3.13 times more likely to score in level 1 in the mathematics exam. They were also 1.85 times more likely to repeat a grade in the study period. Therefore, **these students can be considered to be at substantially higher risk of academic failure.**

Predictive validity:
Raw ECKSI score correlations with district academic data (5 years from assessment):

	n	Predictive Validity	Significance
4th ELA scale score*	761	0.27**	p<.01
4th Mathematics scale* score	759	0.17**	p<.01
Repeat grade in 5 year period	1022	-0.10**	p<.01

Note: **p<.01. Computation on ELA and mathematics only for students who did not repeat a grade.

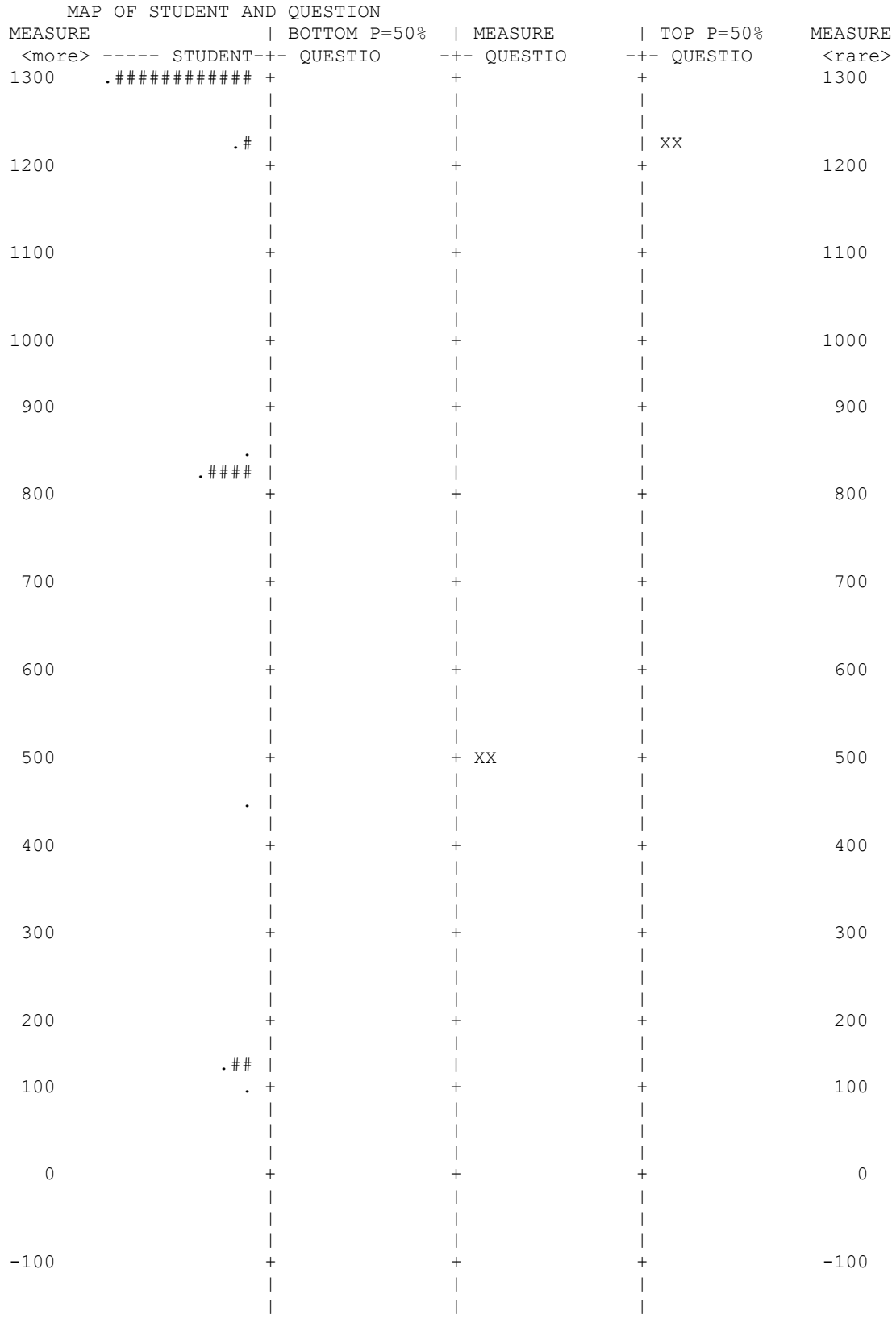
The measure was correlated in the expected direction.

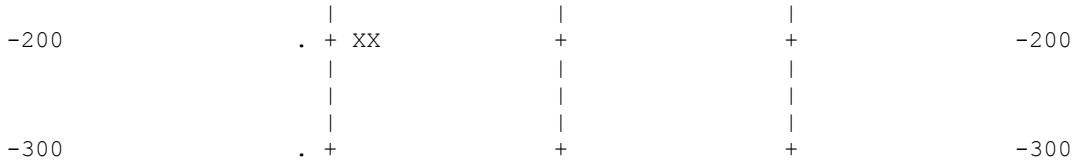
CTT analysis:

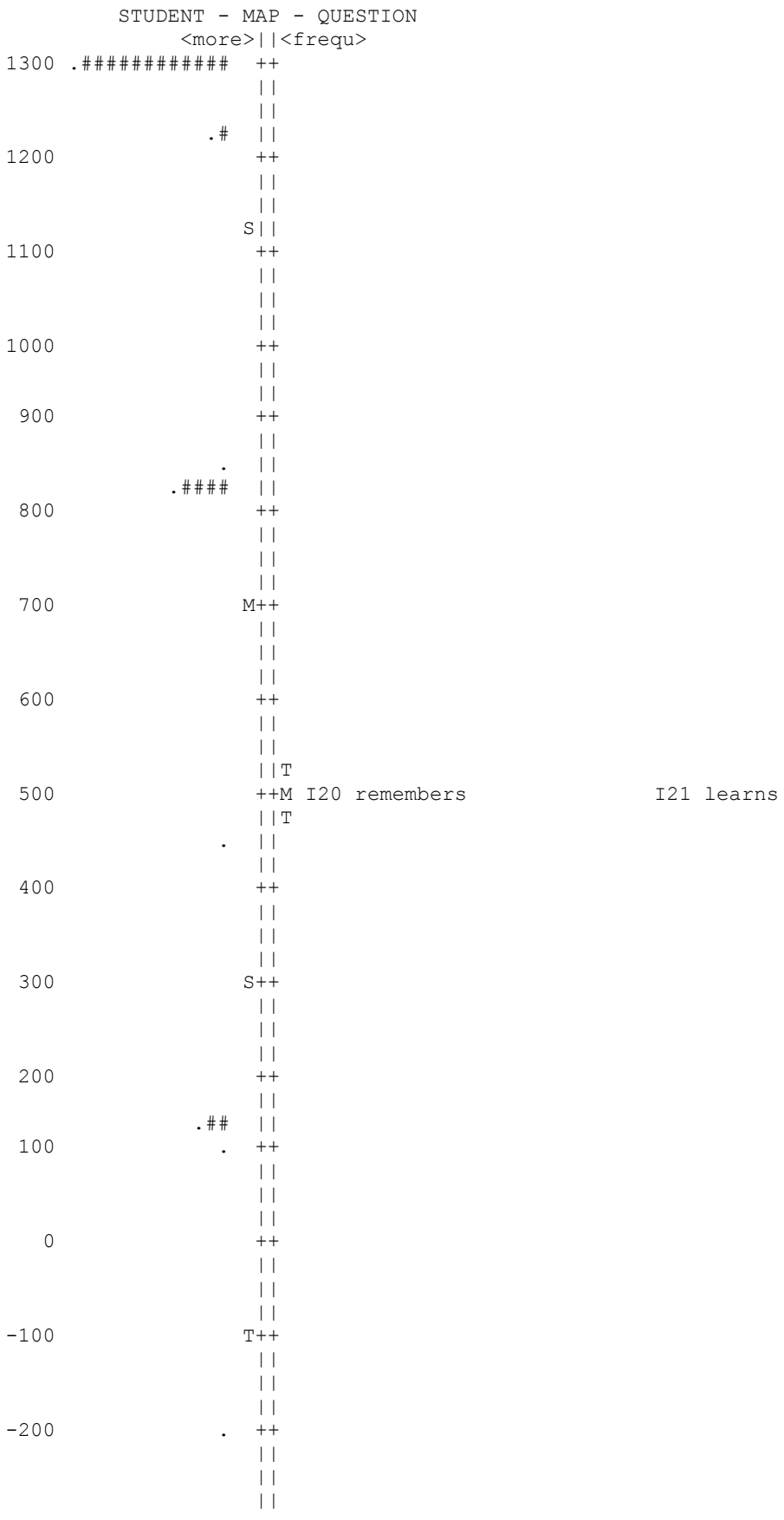
Alpha reliability =.91

Factor structure: 1 factor.

Rasch analysis:







```
-300             .  ++
              <less>||<rare>
EACH "#" IS 49. EACH "." IS 1 TO 48
```

```
EXPECTED SCORE: MEAN   (Rasch-score-point threshold, ":" indicates Rasch-half-point
threshold) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-400200     0   200   400   600   800  1000  1200  1400
|-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   QUESTION
1  1   :        2         :           3          :   44   20  I20 remembers
|                                                      |
|                                                      |
1  1  :         2        :           3           :  4 4   21  I21 learns
|-----+-----+-----+-----+-----+-----+-----+-----+-----|  NUM   QUESTION
-400200     0   200   400   600   800  1000  1200  1400

                1                   2                5
 1    1         0         4          01          9  6 6
 3  2 3         0         2          82          3 20 3  STUDENT
                 T             S           M
 0             10                  30          40   99  PERCENTILE

OBSERVED AVERAGE MEASURES FOR STUDENT (scored) (ILLUSTRATED BY AN OBSERVED CATEGORY)
-200   0    200    400    600    800   1000   1200   1400
|------+------+------+------+------+------+------+------|  NUM   QUESTION
1             2                      3               4|   20  I20 remembers
|                                                       |
|                                                       |
1             2                      3                4   21  I21 learns
|------+------+------+------+------+------+------+------|  NUM   QUESTION
-200   0    200    400    600    800   1000   1200   1400

                                    2                5
2           9          4            1            9  6  6
8          19          2           37            3  2  3  STUDENT
             T               S              M
0          10                     30           40    99  PERCENTILE
```

SUMMARY OF 1108 MEASURED (EXTREME AND NON-EXTREME) STUDENT

	TOTAL SCORE	COUNT	MEASURE	MODEL ERROR	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD
MEAN	6.6	1.9	1082	231				
S.D.	1.7	.3	461	75				
MAX.	8.0	2.0	1406	501				
MIN.	1.0	1.0	-363	141	.00	-1.6	.00	-1.6

REAL RMSE	266	TRUE SD	376	SEPARATION	1.41	STUDEN RELIABILITY	.67
MODEL RMSE	243	TRUE SD	392	SEPARATION	1.61	STUDEN RELIABILITY	.72

S.E. OF STUDENT MEAN = 14

STUDENT RAW SCORE-TO-MEASURE CORRELATION = .84

CRONBACH ALPHA (KR-20) STUDENT RAW SCORE "TEST" RELIABILITY = 1.00

ENTRY NUMBER	TOTAL SCORE	TOTAL COUNT	MEASURE	MODEL S.E.	INFIT MNSQ	INFIT ZSTD	OUTFIT MNSQ	OUTFIT ZSTD	PT-MEASURE CORR.	PT-MEASURE EXP.	EXACT MATCH OBS%	EXACT MATCH EXP%	QUESTION
21	3541	1028	488	14	.99	-.2	.98	.0	A .95	.95	83.1	81.1	I21 learns
20	3800	1102	512	14	.97	-.4	.95	-.2	a .95	.95	83.6	81.5	I20 remembers
MEAN	3670.5	1065.0	500	14	.98	-.3	.97	-.1			83.4	81.3	
S.D.	129.5	37.0	12	0	.01	.1	.01	.1			.3	.2	

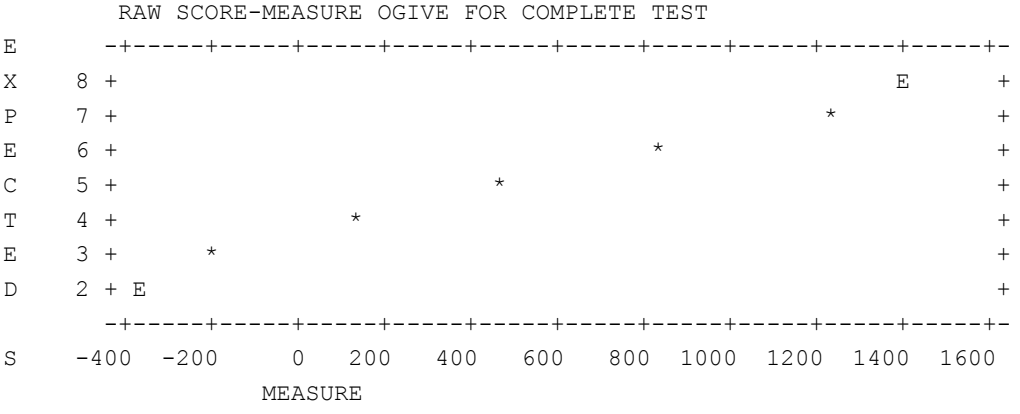
ENTRY NUMBER	DATA CODE	SCORE VALUE	DATA COUNT	DATA %	AVERAGE ABILITY	S.E. MEAN	OUTF MNSQ	PTMEA CORR.	QUESTION
21 A	1	1	21	2	-220.20	46.21	1.7	-.40	I21 learns
	2	2	121	12	190.57	19.60	1.4	-.70	
	3	3	266	26	862.60	12.22	.8	-.27	
	4	4	620	60	1388.90	2.32	.6	.82	
	MISSING	***	113	10#	1128.95	45.27		.03	
20 a	1	1	27	2	-254.87	26.63	.5	-.46	I20 remembers
	2	2	121	11	202.54	15.02	.5	-.67	
	3	3	285	26	880.34	12.58	1.2	-.26	
	4	4	669	61	1383.50	2.64	1.4	.81	
	MISSING	***	39	3#	872.11	177.2		-.03	

Missing % includes all categories. Scored % only of scored categories

TABLE OF MEASURES ON TEST OF 2 QUESTION

SCORE	MEASURE	S.E.	SCORE	MEASURE	S.E.	SCORE	MEASURE	S.E.
2	-364E	198	5	458	141	8	1407E	198
3	-190	141	6	845	353			
4	134	261	7	1233	142			

CURRENT VALUES, UMEAN=500.0000 USCALE=100.0000
TO SET MEASURE RANGE AS 0-100, UMEAN=48.7959 USCALE=5.6482
TO SET MEASURE RANGE TO MATCH RAW SCORE RANGE, UMEAN=4.9278 USCALE=.3389
Predicting Score from Measure: Score = Measure * .0031 + 1.4272
Predicting Measure from Score: Measure = Score * 316.7523 + -447.2141




```
                        1                   2               5
         1    1         0         4         01          9  6 6
STUDEN   3  2 3         0         2         82          3 20 3
                         T             S           M            S
%TILE    0             10                  30          40   99

QUESTI                              2
                                   TMT
%TILE                               0 99
```

TABLE OF SAMPLE NORMS (500/100) AND FREQUENCIES CORRESPONDING TO COMPLETE TEST

SCORE	MEASURE	S.E.	NORMED	S.E.	FREQUENCY	%	CUM.FREQ.	%	PERCENTILE
2	-364E	198	186	43	13	1.2	13	1.2	1
3	-190	141	224	31	15	1.4	28	2.5	2
4	134	261	294	57	100	9.0	128	11.6	7
5	458	141	364	31	42	3.8	170	15.3	13
6	845	353	448	77	220	19.9	390	35.2	25
7	1233	142	533	31	95	8.6	485	43.8	39
8	1407E	198	570	43	623	56.2	1108	100.0	72

THE NORMED SCALE IS EQUIVALENT TO UIMEAN= 265.0466 USCALE= .2171