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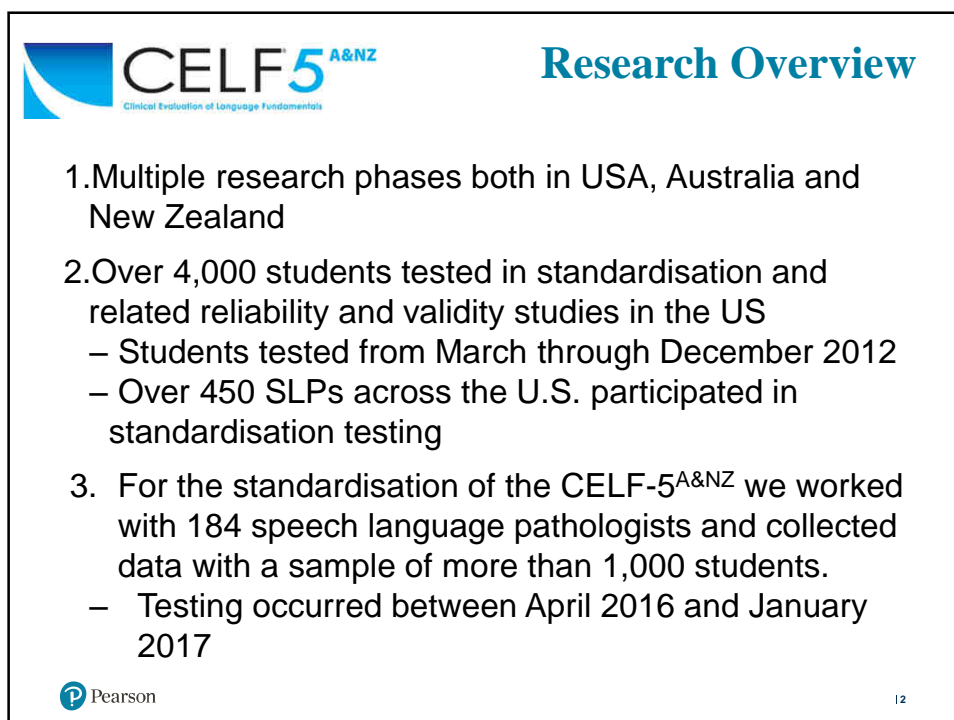
CELF-5^{A&NZ} Reliability & Validity


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#CELF5ANZ
#CELF5


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 **Research Overview**

1. Multiple research phases both in USA, Australia and New Zealand
2. Over 4,000 students tested in standardisation and related reliability and validity studies in the US
 - Students tested from March through December 2012
 - Over 450 SLPs across the U.S. participated in standardisation testing
3. For the standardisation of the CELF-5^{A&NZ} we worked with 184 speech language pathologists and collected data with a sample of more than 1,000 students.
 - Testing occurred between April 2016 and January 2017


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CELF 5^{A&NZ} Multiple Bias Studies
Clinical Evaluation of Language Fundamentals

Multiple phases of objective and subjective reviews of administration directions, cues, test items, and test formats

- Assessment/bias experts examined test items for potential bias related to
 - Socioeconomic status
 - Race/Ethnicity
 - Gender
 - Culture
 - Region
- Clinicians in the field provided feedback about students' responses and engagement in test tasks
- Statistical analysis of bias verified or refuted subjective bias concerns


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CELF 5^{A&NZ} A Diverse Standardisation Sample: Age and Gender
Clinical Evaluation of Language Fundamentals

TABLE 2.3 Demographic Characteristics of the Australian and New Zealand Normative Sample by Age and Gender

Age	Female	Male	Total
5:0–5:5	20	29	49
5:6–5:11	21	31	52
6:0–6:5	23	26	49
6:6–6:11	25	27	52
7:0–7:11	27	34	61
8:0–8:11	36	29	65
9:0–9:11	34	30	64
10:0–10:11	36	25	61
11:0–11:11	32	25	57
12:0–12:11	31	32	63
13:0–13:11	30	20	50
14:0–14:11	25	28	53
15:0–15:11	28	20	48
16:0–16:11	29	27	56
17:0–21:11	31	31	62
Total	428	414	842

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CELF-5^{A&NZ} Reliability and Validity




A Diverse Standardisation Sample: Parent Education Level

TABLE 2.4 Percentage of the Australian and New Zealand Normative Sample and the Australian and New Zealand Population by Parent Education Level

Age	N	Year 11 or below (AU)		Year 12 or equivalent (AU)		Certificate or Diploma (AU)		Degree and above	
		NCEA Level 2 or below (NZ)		NCEA Level 3 or equivalent (NZ)		Level 4 Certificate/ Level 5 or 6 Diploma (NZ)			
		Stratified Sample %	Census %	Stratified Sample %	Census %	Stratified Sample %	Census %	Stratified Sample %	Census %
5:0-5:5	49	14.29	16.68	22.45	22.50	36.73	31.55	26.53	29.27
5:6-5:11	52	15.38	16.68	26.92	22.50	28.85	31.55	28.85	29.27
6:0-6:5	49	18.37	17.01	20.41	22.67	34.69	31.43	26.53	28.88
6:6-6:11	52	15.38	17.01	19.23	22.67	32.69	31.43	32.69	28.88
7:0-7:11	61	14.75	17.37	24.59	23.15	31.15	31.59	29.51	27.89
8:0-8:11	65	18.46	18.09	24.62	23.47	33.85	31.37	23.08	27.07
9:0-9:11	64	21.88	19.05	23.44	23.73	29.69	31.20	25.00	26.03
10:0-10:11	61	22.95	19.82	22.95	24.07	31.15	31.10	22.95	25.00
11:0-11:11	57	15.79	20.45	28.07	24.06	33.33	31.05	22.81	24.44
12:0-12:11	63	22.22	21.60	23.81	24.23	30.16	30.79	23.81	23.39
13:0-13:11	50	20.00	22.30	26.00	24.37	30.00	30.44	24.00	22.89
14:0-14:11	53	18.87	23.21	22.64	24.56	30.19	30.03	28.30	22.20
15:0-15:11	48	25.00	23.39	29.17	24.59	25.00	30.09	20.83	21.93
16:0-16:11	56	23.21	23.89	25.00	24.63	30.36	29.71	21.43	21.77
17:0-21:11	62	24.19	24.27	24.19	25.16	30.65	29.01	20.97	21.55



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A Diverse Standardisation Sample: Region

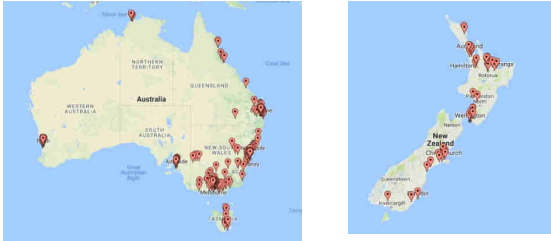
TABLE 2.5 Percentage of the Australian and New Zealand Normative Sample and the Australian and New Zealand Population by Geographic Region

	Stratified Sample		Census
	N	%	%
Australia			
New South Wales	185	22.34	27.21
Victoria	262	31.64	20.85
Queensland	150	18.12	17.99
Western Australia	40	4.83	9.07
South Australia	30	3.62	6.12
Tasmania	17	2.05	1.95
Australian Capital Territory	7	0.85	1.43
Northern Territory	27	3.26	0.97
New Zealand			
North Island	74	8.94	11.32
South Island	36	4.35	3.08
Total	828	100.00	100.00



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CELF 5^{A&NZ}
Clinical Evaluation of Language Fundamentals

Sample Distribution



The normative sample was not specifically stratified based on indigenous status; the recruitment of Aboriginal and Torres Strait Islander and New Zealand Māori participants was incidental and in line with the general Australian and New Zealand population. A total number of 30 Aboriginal and Torres Strait Islanders and 28 New Zealand Māori were included in the normative sample; 4.2% of the Australian sample and 25.5% of the New Zealand sample respectively. These numbers were included to correspond with the 5% representation of Aboriginal and Torres Strait Islander and 25% New Zealand Māori children within the Australian and New Zealand population respectively. (CELF-5^{A&NZ} Examiner's Manual, p. 17)


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Clinical Evaluation of Language Fundamentals


A Diverse Standardisation Sample: Ancestry/Ethnicity

TABLE 2.7 Percentage of the Australian and New Zealand Normative Sample and the Australian and New Zealand Population by Ancestry/Ethnicity

	Stratified Sample		Census
	N	%	%
Australian			
English	315	43.87	31.59
Irish	55	7.66	7.74
Scottish	49	6.82	6.01
Italian	39	5.43	4.75
German	29	4.04	3.18
Chinese	16	2.23	3.72
Australian	403	56.13	45.71
Other	141	19.64	28.42
New Zealand			
New Zealand European	101	91.82	64.88
Māori	22	20.00	22.09
Samoan	1	0.91	6.11
Cook Island Māori	—	—	2.60
Tongan	—	—	2.69
Niuean	—	—	1.00
Chinese	1	0.91	3.46
Indian	4	3.64	3.66
Other	10	9.09	15.26

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CELF-5^{A&NZ} Reliability and Validity




CELF 5^{A&NZ} Raw Score Means and SDs


Clinical Evaluation of Language Fundamentals

Table 7.2 Australia and New Zealand Test Raw Score Means and Standard Deviations

Age	5:0–5:5		5:6–5:11		6:0–6:5		6:6–6:11		7:0–7:11		8:0–8:11		9:0–9:11	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SC	17.7	5.4	19.4	5.1	21.6	3.0	22.7	3.9	23.6	2.2	24.4	2.1		
LC	17.3	5.3	19.2	4.7	19.6	5.1	21.7	4.0	22.2	2.5	23.0	2.2		
WS	21.5	5.3	22.2	5.3	24.4	5.1	25.6	5.7	27.7	3.3	28.8	3.1		
WC	12.4	4.6	13.8	5.0	15.6	5.2	18.3	5.8	20.4	4.8	23.2	5.6	26.0	5.1
FD	7.8	4.1	10.4	4.8	12.6	6.4	14.9	5.7	17.9	5.7	21.2	6.1	24.6	6.0
FS	12.6	8.4	16.7	7.8	20.5	8.4	25.0	7.9	28.7	8.4	33.2	8.6	37.0	7.7
RS	23.0	10.5	24.7	9.4	27.9	11.1	33.6	13.0	39.8	13.6	45.7	12.2	50.5	13.2
USP	8.4	4.5	8.5	4.4	10.4	4.4	11.7	4.0	12.2	3.8	13.4	3.3	13.5	4.5
WD													5.8	2.9
SA													8.3	5.3
SR													9.5	5.2
PP	151.2	32.6	160.6	30.2	158.4	27.1	160.0	33.6	170.5	27.9	170.5	26.1	172.8	27.5
RC											14.1	3.8	11.4	4.7
SW											12.8	3.7	21.7	5.0

SC=sentence comprehension, LC=linguistic concepts, WS=word structure, WC=word classes, FD=following directions, FS=formulated sentences, RS=recalling sentences, USP=understanding spoken paragraphs, WD=word definitions, SA=sentence assembly, SR=semantic relationships, PP=pragmatics profile, RC=reading comprehension, and SW=structured writing.


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CELF 5^{A&NZ} Raw Score Means and SDs (cont.)

Clinical Evaluation of Language Fundamentals

Table 7.2 Australia and New Zealand Test Raw Score Means and Standard Deviations

Age	10:0–10:11		11:0–11:11		12:0–12:11		13:0–13:11		14:0–14:11		15:0–15:11		16:0–16:11		17:0–21:11	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
SC																
LC																
WS																
WC	26.9	4.8	29.9	4.1	30.2	4.1	31.6	5.3	32.8	3.8	33.1	5.9	34.8	4.1	35.5	3.7
FD	5.7		25.2	5.2	26.6	4.1	26.9	5.2	28.1	4.6	27.8	4.5	29.2	3.5	29.0	3.4
FS	38.2	7.0	40.8	6.6	40.9	5.1	40.8	7.1	43.1	4.3	42.7	4.8	44.4	3.8	43.9	4.7
RS	53.2	13.4	56.5	12.2	59.5	9.0	60.3	11.4	62.0	9.4	64.2	7.9	65.2	9.9	66.0	9.5
USP	14.2	3.7	13.8	4.2	13.5	3.6	13.5	3.9	14.3	3.4	11.9	4.3	12.9	3.9	14.6	3.8
WD	7.6	3.7	8.0	3.7	9.1	3.1	9.8	4.3	11.0	3.9	10.9	4.3	12.4	3.6	14.4	4.7
SA	9.4	6.0	11.4	5.0	12.9	4.5	12.2	5.7	14.0	4.7	14.1	4.9	15.6	4.0	16.8	3.8
SR	11.7	5.1	12.4	4.5	14.0	4.7	14.6	4.1	15.3	3.8	15.6	4.2	16.7	3.7	17.4	3.0
PP	178.7	24.9	177.8	27.6	177.1	26.3	181.4	17.5	174.5	30.1	178.7	25.7	185.1	24.9	187.9	18.7
RC	12.6	3.4	11.9	2.6	11.5	3.4	16.4	2.6	16.7	3.2	16.6	3.6	17.5	1.9	18.0	2.0
SW	23.8	6.3	33.2	6.8	34.9	5.1	43.0	8.9	44.9	7.1	43.7	8.1	44.9	5.7	45.7	6.1


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Reliability 101

1. How confident are you in the accuracy of a test score?

2. Reliability = accuracy, consistency and stability of test scores across situations

3. True Score = Observed Score + Error

- Errors are systematic and random
 - **Random errors** are statistical fluctuations in the measured data due to the precision limitations of the data collection process such as variability across examiners and students' performance.
 - **Systematic errors**, by contrast, are reproducible inaccuracies such as slight differences in scoring FS (among examiners and or from one test time to the next).



Internal Consistency & Test-retest

1. Internal consistency: estimates how consistently the items of the test measure one construct (homogeneity)


- Split-half method (Spearman-Brown correction): correlation between the total scores of two half-tests


2. Test-retest stability: correlation between test and retest scores.


- Time interval between the test and retest is as short as possible.




CELF-5^{A&NZ} Reliability and Validity


 Test Reliability Coefficients	
Table 8.1 Australia and New Zealand Internal Consistency Reliability Coefficients of Test Scores	
CELF-5 ^{A&NZ} Test	Average Reliability Coefficients (r_{xx}) across target ages
Sentence Comprehension	.82 Good
Linguistic Concepts	.87 Good
Word Structure	.86 Good
Word Classes	.88 Good
Following Directions	.88 Good
Formulated Sentences	.85 Good
Recalling Sentences	.92 Excellent
Understanding Spoken Paragraphs	.81 Good
Word Definitions	.85 Good
Sentence Assembly	.91 Excellent
Semantic Relationships	.88 Good
Pragmatics Profile	.99 Excellent
Reading Comprehension	.82 Good
Structured Writing	.85 Good



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 Index Score Reliability Coefficients	
Table 8.1 Australia and New Zealand Internal Consistency Reliability Coefficients of Composite Scores	
CELF-5 ^{A&NZ} Index Scores	Average Reliability Coefficients (across target ages)
Core Language Score	.95 Excellent
Receptive Language Index	.93 Excellent
Expressive Language Index	.94 Excellent
Language Content Index	.94 Excellent
Language Structure Index	.95 Excellent
Language Memory Index	.94 Excellent



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CELF-5^{A&NZ} Reliability and Validity

		<h3>Reliabilities for Clinical Groups</h3>		
Table 8.2 Internal Consistency Reliability Coefficients of Test Scores for Clinical Groups				
Clinical Group Test	Language Disorder (n=166)	Learning Disability (Reading & Writing) (n=69)	Autism Spectrum Disorder (n=66)	Average r_{xx}
Sentence Comprehension	.94 Excellent	--	.96 Excellent	.95 Excellent
Linguistic Concepts	.96 Excellent	--	.98 Excellent	.97 Excellent
Word Structure	.93 Excellent	--	.94 Excellent	.94 Excellent
Word Classes	.96 Excellent	.92 Excellent	.97 Excellent	.95 Excellent
Following Directions	.96 Excellent	.90 Excellent	.98 Excellent	.96 Excellent
Formulated Sentences	.97 Excellent	.89 Good	.96 Excellent	.95 Excellent
Recalling Sentences	.98 Excellent	.92 Excellent	.97 Excellent	.96 Excellent

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		<h3>Reliabilities for Clinical Groups (cont.)</h3>		
Table 8.2 Internal Consistency Reliability Coefficients of Test Scores for Clinical Groups				
Clinical Group Test	Language Disorder (n=166)	Learning Disability (Reading & Writing) (n=69)	Autism Spectrum Disorder (n=66)	Average r_{xx}
Understanding Spoken Paragraphs	.81 Good	.75 Acceptable	.91 Excellent	.84 Good
Word Definitions	.87 Good	.91 Excellent	.95 Excellent	.92 Excellent
Sentence Assembly	.92 Excellent	.94 Excellent	.97 Excellent	.95 Excellent
Semantic Relationships	.88 Good	.89 Good	.96 Excellent	.92 Excellent
Pragmatics Profile	.99 Excellent	.99 Excellent	.99 Excellent	.99 Excellent
Reading Comprehension	.93 Excellent	.86 Good	.93 Excellent	.91 Excellent

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Standard Error of Measurement (SEM) & Confidence Interval

Table 8.3 Australian and New Zealand Standard Errors of Measurement for Test and Composite Scores

Test/Composite	5:0-5:5	5:6-5:11	6:0-6:5	6:6-6:11	7:0-7:11	8:0-8:11	9:0-9:11
SC	0.95	1.08	1.44	1.27	1.82	1.20	
LC	0.85	0.95	0.90	1.08	1.37	1.41	
WS	1.12	1.04	0.95	0.90	1.44	1.41	
WC	0.90	0.95	0.99	0.95	1.20	0.99	1.08
FD	1.41	1.04	0.79	0.99	0.90	0.85	1.20
FS	0.90	1.08	0.90	1.08	0.99	0.99	1.04
RS	0.67	0.73	0.90	0.79	0.73	0.85	0.79
USP	1.04	1.31	1.27	1.08	1.44	1.47	1.12
WD							1.08
SA							0.79
SR							0.90
PP	0.30	0.42	0.30	0.30	0.42	0.30	0.30
RC						1.12	1.04
SW						1.62	1.27
CLS	3.00	3.00	3.35	3.00	4.24	3.35	3.00
RLI	3.97	3.67	3.67	3.67	4.74	3.67	3.67
ELI	3.35	3.35	3.00	3.00	3.97	3.67	3.00
LCI	3.67	3.35	3.00	3.35	3.97	3.67	3.67
LSI	3.00	3.00	3.35	3.00	4.24	3.35	
LMI							3.35



Standard Error of Measurement (SEM) & Confidence Interval (cont.)

Table 8.3 Australian and New Zealand Standard Errors of Measurement for Test and Composite Scores

Test/Composite	10:0-10:11	11:0-11:11	12:0-12:11	13:0-13:11	14:0-14:11	15:0-15:11	16:0-16:11	17:0-21:11	Average SEM
SC									1.32
LC									1.12
WS									1.16
WC	1.16	1.16	0.95	1.16	1.27	0.85	1.08	1.16	1.06
FD	0.90	1.08	1.20	0.85	0.85	1.20	1.20	1.20	1.06
FS	1.16	1.04	1.34	1.34	1.37	1.12	1.64	1.41	1.18
RS	0.73	0.85	1.16	0.85	0.73	1.20	0.79	0.73	0.85
USP	1.16	1.08	1.50	1.53	1.53	1.20	1.53	1.62	1.34
WD	1.20	1.12	1.53	1.04	1.16	1.16	1.16	0.95	1.17
SA	0.73	0.85	0.85	0.67	0.95	0.95	1.31	0.90	0.91
SR	1.08	1.24	0.90	0.95	1.08	0.95	1.08	1.31	1.06
PP	0.30	0.30	0.30	0.73	0.30	0.42	0.30	0.30	0.37
RC	1.56	1.64	1.31	1.27	1.12	0.99	1.80	1.08	1.32
SW	0.79	1.04	1.16	1.12	1.04	0.95	1.56	1.04	1.19
CLS	3.35	3.35	3.35	3.67	3.67	3.67	3.97	4.24	3.50
RLI	3.67	3.97	3.67	4.24	4.50	3.35	4.24	4.50	3.97
ELI	3.35	3.00	4.24	3.35	3.67	3.97	4.74	3.97	3.61
LCI	3.97	3.97	4.50	3.97	4.50	3.35	4.50	4.24	3.87
LSI									3.35
LMI	3.35	3.35	4.50	3.35	3.67	4.24	4.24	3.97	3.81



Determining Test Confidence Intervals for Scaled Scores

Figure 4.29 Australian and New Zealand Test Scaled Score Norms

Scaled Score	WC	FD	FS	RS	USP	WD	SA	SR	PP	RC	SW	Scaled Score
19	40	—	—	78	—	19-21	—	—	—	—	48-54	19
18	39	—	—	77	—	18	—	—	—	—	47	18
17	38	—	—	76	20	17	20	—	—	—	45-46	17
16	37	33	48	74-75	19	16	—	20	—	—	44	16
15	36	—	47	72-73	—	15	19	19	—	16	42-43	15
14	—	32	46	70-71	18	13-14	18	—	200	—	41	14
13	35	31	45	68-69	—	12	17	18	199	15	39-40	13
12	34	30	44	66-67	17	11	16	17	196-198	14	38	12
11	32-33	28-29	—	63-65	16	10	15	16	189-195	13	37	11
10	31	27	43	59-62	15	9	13-14	14-15	180-188	12	35-36	10
9	29-30	25-26	41-42	56-58	14	8	11-12	12-13	169-179	11	33-34	9
8	27-28	23-24	38-40	52-55	13	7	9-10	10-11	158-168	10	31-32	8
7	25-26	21-22	34-37	47-51	11-12	5-6	7-8	9	147-157	9	29-30	7
6	23-24	19-20	31-33	41-46	9-10	4	5-6	7-8	135-146	8	26-28	6
5	21-22	16-18	28-30	35-40	7-8	3	4	5-6	122-134	7	23-25	5
4	18-20	12-15	25-27	29-34	5-6	2	3	3-4	108-121	6	19-22	4
3	16-17	9-11	21-24	23-28	3-4	1	2	2	93-107	4-5	15-18	3
2	14-15	6-8	16-20	18-22	2	0	1	1	78-92	3	12-14	2
1	0-13	0-5	0-15	0-17	0-1	—	0	0	50-77	0-2	0-11	1

Scaled Score Points for Building Confidence Intervals												
Confidence Level	WC	FD	FS	RS	USP	WD	SA	SR	PP	RC	SW	Confidence Level
68%	1	1	1	1	2	2	1	1	1	1	1	68%
90%	2	2	2	2	2	3	1	1	1	2	2	90%
95%	2	2	3	2	3	3	2	2	1	3	2	95%

CELF-5^{A&NZ} Examiner's Manual, pp 145; Appendices A & B



Determining Percentile Ranks and Percentile Rank Confidence Intervals

Appendix D
CELF-5^{A&NZ} Examiner's Manual, p. 314




APPENDIX D Australian and New Zealand Percentile Ranks, Normal Curve Equivalents, and Stanines

Test Scaled Score	Core & Index Standard Score	Percentile Rank	Normal Curve Equivalent	Stanine	Test Scaled Score	Core & Index Standard Score	Percentile Rank	Normal Curve Equivalent	Stanine
100	>99.9	>99	9	10	99	50	50	5	5
159	>99.9	>99	9	9	98	45	47	49	5
158	>99.9	>99	9	9	97	42	46	5	5
157	>99.9	>99	9	9	96	39	44	4	4
156	>99.9	>99	9	9	95	37	43	4	4
155	>99.9	>99	9	9	94	34	42	4	4
154	>99.9	>99	9	9	93	32	40	4	4
153	>99.9	>99	9	9	92	30	39	4	4
152	>99.9	>99	9	9	91	27	37	4	4
151	>99.9	>99	9	9	90	25	36	4	4
150	>99.9	>99	9	9	89	23	35	4	4
149	99.9	>99	9	9	88	21	33	3	3
148	99.9	>99	9	9	87	19	32	3	3
147	99.9	>99	9	9	86	18	30	3	3
146	99.9	>99	9	9	85	16	29	3	3
145	99.9	>99	9	9	84	14	28	3	3
144	99.8	>99	9	9	83	13	26	3	3
143	99.8	>99	9	9	82	12	25	3	3
142	99.7	>99	9	9	81	10	23	2	2
141	99.7	>99	9	9	80	9	22	2	2
140	99.5	>99	9	9	79	8	21	2	2
139	99.5	>99	9	9	78	7	19	2	2
138	99	>99	9	9	77	6	18	2	2
137	99	>99	9	9	76	5	16	2	2
136	99	>99	9	9	75	5	15	2	2
135	99	>99	9	9	74	4	13	2	2
134	99	>99	9	9	73	4	12	1	1
133	99	>99	9	9	72	3	11	1	1
132	98	95	9	9	71	3	9	1	1
131	98	94	9	9	70	2	8	1	1
130	98	92	9	9	69	2	6	1	1
129	97	91	9	9	68	2	5	1	1
128	97	89	9	9	67	1	4	1	1
127	96	88	9	9	66	1	2	1	1
126	96	87	8	8	65	1	1	1	1
125	95	85	8	8	64	1	<1	1	1
124	95	84	8	8	63	1	<1	1	1
123	94	82	8	8	62	1	<1	1	1
122	93	81	8	8	61	0.5	<1	1	1
121	92	79	8	8	60	0.4	<1	1	1
120	91	78	8	8	59	0.3	<1	1	1
119	90	77	8	8	58	0.3	<1	1	1
118	88	75	7	7	57	0.2	<1	1	1
117	87	74	7	7	56	0.2	<1	1	1
116	86	72	7	7	55	0.1	<1	1	1
115	84	71	7	7	54	0.1	<1	1	1
114	82	70	7	7	53	0.1	<1	1	1
113	81	68	7	7	52	0.1	<1	1	1
112	79	67	7	7	51	0.1	<1	1	1
111	77	65	6	6	50	<0.1	<1	1	1
110	75	64	6	6	49	<0.1	<1	1	1
109	73	63	6	6	48	<0.1	<1	1	1
108	70	61	6	6	47	<0.1	<1	1	1
107	68	60	6	6	46	<0.1	<1	1	1
106	66	58	6	6	45	<0.1	<1	1	1
105	63	57	6	6	44	<0.1	<1	1	1
104	61	56	6	6	43	<0.1	<1	1	1
103	58	54	5	5	42	<0.1	<1	1	1
102	55	53	5	5	41	<0.1	<1	1	1
101	53	51	5	5	40	<0.1	<1	1	1

CELF 5^{A&NZ} **Test-retest Stability**
Clinical Evolution of Language Fundamentals

Table 8.4 Stability Coefficients for the Test and Composite Scores


Test Retest Stability (n= 137)		Test-retest interval: 7-46 days				Mean: 19 days		
All Ages Test/Composite	n	Test		Retest		r	Corrected r	Standard Difference
		Mean	SD	Mean	SD			
SC	77	10.3	2.9	11.4	3.0	.76	.77	0.37
LC	80	10.4	2.9	10.8	2.9	.73	.80	0.14
WS	80	10.5	2.8	12.0	3.2	.78	.85	0.50
WC	136	9.9	2.9	10.7	3.0	.85	.86	0.27
FD	131	10.8	2.8	10.9	2.9	.77	.79	0.04
FS	134	10.3	3.2	11.0	3.0	.79	.76	0.23
RS	133	10.5	2.9	11.3	3.0	.89	.90	0.27
USP	133	10.4	2.8	11.4	2.7	.80	.83	0.36
WD	57	9.6	2.7	10.2	3.3	.72	.80	0.20
SA	56	10.0	2.9	11.6	3.0	.86	.87	0.54
SR	57	10.1	2.7	10.8	2.6	.73	.78	0.26
PP	131	10.1	3.1	10.5	3.0	.89	.89	0.13
RC	75	10.3	2.7	10.7	2.8	.64	.72	0.15
CLS	133	102.3	14.7	108.3	15.3	.89	.89	0.40
RLI	135	101.8	14.8	106.2	15.0	.88	.88	0.30
ELI	133	102.5	14.9	108.1	14.9	.90	.90	0.38
LCI	136	101.2	14.9	105.2	14.5	.86	.86	0.27
LSI	78	103.7	14.4	109.7	15.5	.86	.88	0.40
LMI	55	100.8	15.9	105.1	16.1	.86	.83	0.27


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CELF 5^{A&NZ} **Testing for Re-evaluation**
Clinical Evolution of Language Fundamentals

Consider these factors when making retest decisions:


- Retesting should be conducted when, in the opinion of the examiner, the student is not likely to remember the test items and/or his or her responses when tested previously.
 - If retesting is required prior to this time, changes in performance should be interpreted in comparison to **mean differences between original and retest scores** obtained in the test-retest study (see Chapter 8, Table 8.4).
- Retesting should be conducted when the examiner thinks the child has made progress since the previous test administration.
- Retesting can be conducted when the student's age at testing requires the next-age norms table to score (6 month intervals for 5 and 6 year olds and 12 month intervals for students 7 years and older)
- Retesting can be conducted when other factors negatively affecting the student's performance (e.g., illness, inattention) cause you to question the accuracy of previous test results.


 Pearson CELF-5^{A&NZ} Examiner's Manual, pp 33-34. 122



Inter-scoring Agreement

Inter-scoring agreement	Reliability
Word Structure	.99
Formulated Sentences	.95
Word Definitions	.91
Structured Writing	.96


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Score Differences


Interpretation of performance

1. Examine if difference is statistically significant
 - Reflection of Standard Error
2. Examine if difference is clinically significant (rare ≤ 10-15%)

Discrepancy Comparison Example

Discrepancy Comparisons							
	Score 1	Score 2	Difference	Critical Value	Significant Difference	Prevalence in Normative Sample	Statistically Significant Level
Receptive-Expressive Language Index	79	71	8	8	Yes/No	22.7	.15/.05
Language Content-Memory Index*	75	76	-1	8	Yes/No	46.6	.15/.05

*See Appendix F in Examiner's Manual.


CELF-5^{A&NZ} Examiner's Manual, p. 148
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Validity 101

1. How well can your test results predict the presence of a disorder (or, predict one's skill)?

2. Validity is demonstrated through evidence supporting a test's interpretations and uses.

– Validity Evidence: the degree to which specific data, research, or theory supports that:

1. A test measures the concepts it's supposed to measure
2. The test is applicable to its intended population



Evidence Based on Test Content


Validity evidence related to test content

- **Content Relevance:** when the content areas being measured are accepted as relating to the proposed construct
- **Content Coverage:** when the content areas measured by the test are accepted to be an adequate sampling of these areas (also developmentally appropriate)

Validity evidence includes: literature review; users' feedback; and expert review.

1. CELF-5^{A&NZ} is designed to reflect the development of language abilities of students ages 5–21 years.
2. The goal of the content was to make sure that the tests and test items on the test were able to adequately sample all the different language domains.
3. Test developers paid particular attention to content that reflects the complex linguistic processes of adolescents and young adults


CELF-5^{A&NZ} Reliability and Validity




Convergent Validity: Intercorrelation Studies

Table 9.4 Australian and New Zealand Intercorrelations of Norm-Referenced Tests and Composites

Test/ Composite	SC	LC	WS	WC	FD	FS	RS	USP	WD	SA	SR	PP	RC	SW	CLS	RLI	ELI	LCI	LSI	LMI
SC															.62	.59				.62
LC	.60																			
WS	.51	.58																		
WC	.50	.59	.48																	
FD	.53	.66	.56	.55											.68	.65		.64		
FS	.54	.60	.57	.54	.55										.66	.61	.64			.63
RS	.55	.64	.58	.60	.60	.60									.70	.64	.64		.71	.59
USP	.49	.57	.58	.56	.54	.54	.61								.62	.61				.65
WD				.62	.49	.52	.56	.64												.75
SA				.55	.44	.47	.48	.51	.53										.53	.62
SR				.61	.53	.50	.58	.55	.60	.55						.65	.65			
PP				.33	.29	.36	.34	.40	.33	.30	.30									
RC	.37	.38	.40	.33	.29	.36	.34	.40	.33	.30										
SW	.52	.42	.32	.37	.31	.39	.33	.29	.35	.34	.34	.21	.32							
CLS	.77	.73	.81	.73	.67	.81	.84	.73	.71	.62	.81	.41	.69	.44						
RLI	.80	.74	.62	.85	.78	.64	.70	.73	.71	.64	.85	.38	.68	.42	.89					
ELI	.62	.70	.83	.66	.65	.84	.85	.67	.65	.80	.67	.40	.65	.44	.95	.78				
LCI	.63	.87	.62	.84	.74	.63	.68	.78	.81	.75	.68	.39	.70	.41	.84	.92	.80			
LSI	.77	.73	.81	.66	.70	.85	.85	.69				.46	.69	.49		.85	.97	.81		
LMI				.65	.84	.82	.86	.63	.62	.54	.64	.34	.60	.40	.91	.80	.91	.73		
Mean	10.2	10.1	10.1	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	100.3	100.2	100.2	100.1	100.4	99.9
SD	2.8	2.9	2.9	3.0	3.0	3.0	3.0	3.0	3.2	3.1	3.0	2.9	3.0	2.9	14.8	15.0	14.7	15.5	14.9	14.3
n	328	328	328	841	842	819	839	839	514	510	514	832	568	550	815	841	812	836	323	493



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Relationship with Other Variables (CELF-4)

Table 9.4 Means, Standard Deviations and Correlation Coefficients Between CELF-5 and CELF-4 Test and Composite Scores

Test/Composite	CELF-5			CELF-4		
	Mean	SD	n	Mean	SD	n
SC	10.8	2.3	59	11.0	2.7	59
LC	10.7	2.5	61	10.2	2.9	61
WS	10.7	2.2	53	10.4	2.3	53
WC	10.7	2.7	100	10.9	2.6	100
FD	10.6	2.6	91	10.2	2.9	91
FS	11.4	3.0	97	11.9	2.5	97
RS	11.3	3.1	99	10.3	2.9	99
USP	10.3	2.8	97	10.6	2.6	97
WD	10.5	2.5	30	11.6	2.7	30
SA	11.0	3.2	37	10.2	3.3	37
SR	10.9	2.2	38	10.2	2.9	38
PP	11.0	2.8	80	12.1	1.9	80
CLS	106.6	13.3	96	104.7	13.8	96
RLI	104.7	12.6	97	104.5	13.7	97
ELI	107.2	14.1	97	105.6	13.4	97
LCI	103.9	13.5	100	106.3	14.5	100
LSI	107.0	13.7	60	104.9	13.0	60
LMI	106.3	14.6	38	106.8	14.3	38


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CELF-5^{A&NZ} Reliability and Validity




CELF 5^{A&NZ}
Clinical Evaluation of Language Fundamentals

CELF-5^{A&NZ} to CELF-4 Australian (cont.)

Test/Composite	<i>r</i>	Corrected <i>r</i>	Standard Difference
SC	.59	.64	0.08
LC	.72	.75	0.18
WS	.65	.76	0.13
WC	.65	.73	0.08
FD	.61	.64	0.15
FS	.67	.71	0.18
RS	.88	.88	0.33
USP	.64	.69	0.11
WD	.74	.80	0.42
SA	.78	.75	0.25
SR	.72	.76	0.27
PP	.68	.77	0.46
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CLS	.86	.88	0.14
RLI	.78	.82	0.02
ELI	.84	.86	0.12
LCI	.86	.87	0.17
LSI	.82	.85	0.16
LMI	.92	.92	0.03


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CELF 5^{A&NZ}
Clinical Evaluation of Language Fundamentals


Language Disorder Study

Table 9.7 Mean Performance and Difference of Test Scores for Australian and New Zealand Students Diagnosed With a Language Disorder and a Typically Developing Matched Sample

Test/ Composite	LD		Matched Sample		<i>n</i>	Mean Difference of Two Samples			Standard Difference	
	Mean	<i>SD</i>	Mean	<i>SD</i>		Difference	<i>t</i> value	<i>p</i>		
SC	6.1	1.9	11.2	1.9	10	5.10	6.65	<.01	2.68	
LC	5.9	2.2	12.5	2.2	10	6.60	6.90	<.01	3.00	
WS	6.0	3.4	11.6	2.4	10	5.60	4.55	<.01	1.90	
WC	7.2	1.5	11.5	2.4	20	4.30	7.78	<.01	2.15	
FD	5.8	2.4	10.5	2.2	20	4.70	6.38	<.01	2.04	
FS	6.2	2.1	11.4	2.7	18	5.22	5.74	<.01	2.16	
RS	4.9	1.7	11.2	2.0	18	6.22	8.80	<.01	3.35	
USP	5.2	1.2	10.9	2.2	20	5.70	9.13	<.01	3.22	
WD	5.6	2.3	11.4	2.7	10	5.80	4.91	<.01	2.31	
SA	7.4	2.2	10.8	3.9	10	3.40	2.78	0.02	1.07	
SR	5.1	2.3	10.5	1.8	10	5.40	9.29	<.01	2.61	
PP	7.0	2.5	10.7	2.6	20	3.70	4.54	<.01	1.45	
RC	5.1	1.6	9.9	2.6	10	4.80	4.52	<.01	2.22	
SW	8.1	2.1	9.9	3.1	7	1.71	1.69	0.14	0.65	
<hr/>										
CLS	75.6	9.1	106.6	7.6	17	31.06	9.20	<.01	3.70	
RLI	77.0	6.0	105.6	9.3	20	28.65	11.79	<.01	3.66	
ELI	75.8	10.4	107.1	9.1	17	31.29	8.00	<.01	3.20	
LCI	77.4	7.2	108.5	11.1	20	31.10	11.57	<.01	3.32	
LSI	74.7	10.8	110.0	7.6	10	35.30	7.39	<.01	3.78	
LMI	77.0	4.8	102.9	9.4	7	25.86	7.74	<.01	3.46	


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CELF-5^{A&NZ} Reliability and Validity




Learning Disorder (Reading and/or Writing)

Table 9.9 Mean Performance and Difference of Scores for Australian and New Zealand Students Diagnosed With Specific Learning Disability (Reading and/or Written Expression) and a Typically Developing Matched Sample

Test/ Composite	SLD-RW		Matched Sample		n	Mean Difference of Two Samples			Standard Difference
	Mean	SD	Mean	SD		Difference	t value	p	
WC	8.3	1.8	10.6	2.8	24	2.29	3.16	<.01	0.97
FD	8.9	3.3	10.5	2.7	24	1.58	1.86	0.08	0.52
FS	8.9	2.5	9.7	2.7	22	0.82	1.20	0.24	0.32
RS	9.7	2.5	11.0	3.0	24	1.38	2.09	0.05	0.50
USP	9.8	3.3	10.2	2.8	24	0.38	0.50	0.62	0.12
WD	8.6	3.0	11.8	2.6	19	3.21	3.49	<.01	1.14
SA	8.0	2.0	10.3	2.7	19	2.32	3.81	<.01	0.98
SR	8.7	2.4	10.8	3.1	19	2.16	2.24	0.04	0.78
PP	9.7	2.6	10.3	2.3	24	0.63	0.99	0.33	0.26
RC	7.9	2.4	11.2	3.1	21	3.29	5.85	<.01	1.19
SW	8.3	2.7	10.3	2.6	19	2.00	2.96	<.01	0.75
CLS	94.0	10.4	102.5	13.9	22	8.45	2.52	0.02	0.69
RLI	92.8	11.8	103.5	14.5	24	10.71	2.67	0.01	0.81
ELI	93.1	12.4	101.2	13.9	22	8.05	2.62	0.02	0.61
LCI	92.9	13.4	104.3	15.6	24	11.42	2.95	<.01	0.79
LMI	93.4	10.4	104.5	11.7	17	11.12	3.25	<.01	1.00



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Autism Spectrum Disorder with Language Impairment

Table 9.10 Mean Performance and Difference of Scores for Australian and New Zealand Students Diagnosed With Autism Spectrum Disorder with Language Impairment and a Typically Developing Matched Sample

Test/ Composite	ASD-L		Matched Sample		n	Mean Difference of Two Samples			Standard Difference
	Mean	SD	Mean	SD		Difference	t value	p	
SC	5.1	3.5	9.4	1.8	14	4.29	3.82	<.01	1.54
LC	4.9	2.2	10.4	2.6	14	5.50	6.15	<.01	2.28
WS	5.3	2.9	10.6	2.5	14	5.29	5.16	<.01	1.95
WC	6.2	3.2	10.5	1.8	25	4.24	6.22	<.01	1.63
FD	6.0	3.1	10.9	2.5	25	4.96	6.47	<.01	1.76
FS	5.2	3.0	9.7	2.5	23	4.43	6.34	<.01	1.60
RS	4.8	3.1	9.7	2.9	25	4.92	6.27	<.01	1.64
USP	5.6	3.1	10.2	2.5	25	4.64	6.65	<.01	1.65
WD	6.0	2.1	10.1	2.6	11	4.09	4.27	<.01	1.73
SA	5.4	3.1	10.5	2.6	11	5.18	3.95	<.01	1.81
SR	5.9	3.6	10.4	2.2	11	4.45	3.48	<.01	1.49
PP	4.4	2.2	10.2	2.9	25	5.72	7.84	<.01	2.22
RC	6.0	4.5	10.0	2.4	11	4.00	3.32	<.01	1.11
SW	6.9	2.5	11.0	1.4	11	4.09	4.83	<.01	2.02
CLS	72.9	18.2	99.4	9.7	23	26.57	6.71	<.01	1.82
RLI	75.3	17.5	101.6	9.6	25	26.24	6.95	<.01	1.86
ELI	72.1	17.0	100.0	11.8	23	27.96	7.01	<.01	1.91
LCI	74.7	16.0	101.9	9.1	25	27.16	8.25	<.01	2.09
LSI	71.4	17.5	97.6	11.9	14	26.14	5.08	<.01	1.75
LMI	75.9	12.8	105.2	5.1	9	29.33	5.83	<.01	3.01



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CELF-5^{A&NZ} Reliability and Validity



Clinical Applications: HI


- There are additional considerations required for assessing children diagnosed with hearing loss.
- An in-depth study was undertaken with this population to investigate CELF-5^{A&NZ} performance of children with hearing loss who received early intervention.
- The **National Acoustic Laboratories** collaborated with Pearson Clinical Assessment in Australia to collect new data.
- Consistent with current literature, it was expected that the effect size of hearing loss on language development would be reduced, compared to previous populations who did not have access to early intervention.
- The study aims were to:
 - a. determine CELF-5^{A&NZ} performance of children with hearing loss who have received early intervention, and
 - b. to outline the standardised administration requirements for this population.

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Clinical Applications: HI

- The sample comprised 30 children diagnosed with hearing loss ranging from mild to severe degrees who received hearing aids before 6 months of age
- Another 30 children (13 females, 17 males) with severe or profound hearing loss who first received a cochlear implant before 2 years of age.
- All children had nonverbal cognitive abilities within the normal range.
- All were regular users of personal hearing devices that are routinely managed by audiologists.
- On average, children's performance were within 1 SD below the normative mean.
- The effect sizes across Core Language Score and Index scores ranged from small to moderate (0.42 to 0.83).
- Index Score Strengths: LSI | Weakness: LMI
- Test Scores: WD and SR showed the largest effect sizes (0.93 to 0.95).

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CELF-5^{A&NZ} Reliability and Validity




Clinical Group Studies: HI

Table 9.12 Mean Performance and Difference of Scores for Australian Children With Mild to Moderate Hearing Impairment (fitted with Hearing Aids) and a Typically Developing Matched Sample

Test/ Composite	HA		Matched Sample		n	Mean Difference of Two Samples			Standard Difference
	Mean	SD	Mean	SD		Difference	t value	p	
SC	9.9	3.1	10.6	2.9	15	0.67	0.92	0.37	0.22
LC	10.1	3.1	10.3	2.3	15	0.13	0.12	0.90	0.05
WS	9.0	3.0	10.3	2.2	15	1.27	1.23	0.24	0.48
WC	9.8	2.1	10.5	3.2	30	0.67	1.05	0.30	0.25
FD	9.3	2.7	10.8	3.0	30	1.57	1.85	0.07	0.55
FS	8.7	3.2	10.7	2.9	30	1.97	3.06	<.01	0.65
RS	9.6	3.3	11.0	2.8	30	1.47	2.00	0.05	0.48
USP	8.7	3.0	10.3	2.6	30	1.63	2.15	0.04	0.58
WD	9.5	2.9	11.9	2.4	15	2.47	2.98	<.01	0.93
SA	9.7	2.7	11.5	2.7	15	1.87	2.03	0.06	0.69
SR	9.1	2.7	11.8	2.9	15	2.67	2.60	0.02	0.95
PP	9.1	2.4	10.8	2.4	30	1.67	2.64	0.01	0.70
RC	9.2	2.6	10.8	3.3	18	1.56	1.80	0.09	0.53
SW	10.1	3.5	10.3	2.5	18	0.22	0.24	0.81	0.07
CLS	96.0	14.5	105.6	13.3	30	9.63	3.25	<.01	0.69
RLI	97.3	12.2	105.4	14.8	30	8.10	2.37	0.02	0.60
ELI	95.3	16.1	105.2	12.9	30	9.97	2.99	<.01	0.68
LCI	96.6	14.2	104.4	12.2	30	7.73	2.18	0.04	0.58
LSI	96.3	15.8	102.9	15.2	15	6.53	1.43	0.17	0.42
LMI	94.5	16.8	106.8	12.3	15	12.27	2.52	0.02	0.83



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Clinical Applications: HI

Table 9.13 Mean Performance and Difference of Scores for Australian Children With Severe to Profound Hearing Impairment (fitted with Cochlear Implants) and a Typically Developing Matched Sample

Test/ Composite	CI		Matched Sample		n	Mean Difference of Two Samples			Standard Difference
	Mean	SD	Mean	SD		Difference	t value	p	
SC	8.6	4.0	10.9	1.5	15	2.27	1.91	0.08	0.75
LC	7.5	4.1	10.8	2.2	15	3.27	2.78	0.01	0.99
WS	6.4	3.7	11.1	2.6	15	4.73	3.47	<.01	1.48
WC	8.3	2.7	10.7	2.8	30	2.40	3.04	<.01	0.87
FD	7.3	3.2	11.2	2.9	30	3.97	4.45	<.01	1.30
FS	6.7	3.3	10.6	2.2	29	3.93	4.75	<.01	1.40
RS	7.3	3.8	11.2	2.8	30	3.93	4.51	<.01	1.18
USP	7.3	3.6	11.8	2.6	29	4.48	5.07	<.01	1.43
WD	7.7	3.5	11.7	2.3	15	3.93	4.49	<.01	1.33
SA	7.9	2.5	10.9	3.0	15	3.07	3.57	<.01	1.11
SR	8.3	3.1	11.8	2.6	15	3.53	3.44	<.01	1.23
PP	8.3	2.7	10.6	2.7	29	2.34	3.35	<.01	0.87
RC	7.7	3.7	11.7	2.8	18	4.00	3.61	<.01	1.22
SW	10.0	3.1	10.6	3.1	18	0.56	0.50	0.62	0.18
CLS	86.9	17.7	106.0	9.8	28	19.04	4.64	<.01	1.33
RLI	89.3	15.6	106.6	13.5	29	17.31	4.15	<.01	1.19
ELI	82.9	18.2	105.1	10.3	29	22.17	5.40	<.01	1.50
LCI	88.1	16.6	107.0	13.7	29	18.90	4.67	<.01	1.24
LSI	83.1	20.4	105.9	11.4	15	22.87	3.43	<.01	1.38
LMI	86.6	15.6	105.0	7.7	14	18.36	3.86	<.01	1.49


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Clinical Applications: HI

- Across all scores, the effect size of hearing loss on language abilities of children using cochlear implants more than doubled that of children using hearing aids.
- This suggests that the impact increases with the degree of hearing loss.
- Children with hearing loss who use either hearing aids or cochlear implants had **Structured Writing scores** that did not significantly differ from those of typically hearing peers.



Guide to Administration for Hearing Impaired Populations
CELF-5^{A&NZ} Examiner's Manual, p. 248

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Sensitivity & Specificity 101

- **Sensitivity:** The probability that someone who has the “condition” will test positive for it.
- **Specificity:** The probability that someone who does not have the “condition” will test negative.

Errors

- **False Positive:** A student who is falsely identified as having a condition or disorder (**over-referrals**)
- **False Negative:** A student with a condition or disorder who is not correctly identified by a test (**the most serious error**).


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CELF-5^{A&NZ} Diagnostic Accuracy

Table 9.8 Australian and New Zealand Clinical Validity Studies

CLS, RLI, or ELI Score \leq SD	Standard Score Cut	Sensitivity	Specificity
-1 SD	85	1.00	1.00
-1.3 SD	80	.85	1.00
-1.5 SD	77	.75	1.00
-2 SD	70	.30	1.00



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CELF-5^{A&NZ} Results +

It is important to consider all the information about the student in conjunction with the CELF-5^{A&NZ} results.

Additional information may include:

1. Developmental history
2. Medical history
3. Academic history
4. Comparison of the student's academic progress to peers of a similar cultural background with English as a second language
5. Parent interview
6. Observations
7. Input from other professionals
8. Language sampling
9. Dynamic (how easily a student learns new tasks in the learning environments), criterion-referenced, or norm-referenced assessments.

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CELF-5 vs CELF-5^{A&NZ} in reports

Typing superscript in Word

Enable superscript: Click the x² button in the Font group on the Home tab.

Select the text that you want to format as superscript.

Do one of the following: On the Home tab, in the Font group, click Subscript. Or press CTRL+=. To undo the formatting, click the Superscript button again, or repeat the keyboard shortcut. (or Control Z)

Typing Superscript Text in Mac OS X

Pull down the “Format” menu and go to “Font”

Select the “Baseline” submenu and choose either “Superscript”

Type the desired text to be superscripted, then go back to the same menu and choose “Use Default” to return to normal baseline text or uncheck “Superscript” box.



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