

**Supplemental Material S1.** Proposal for clinical use of the age norms.

**Note:** The tables should only be used with data collected under diagnostic conditions similar to the approach applied to the calibration sample (see Methods section of main article for details).

- (1) Compare the child’s score on one of the parameters with the age-specific 2.5<sup>th</sup> percentile (see tables on the following pages). If the child scores higher than the 2.5<sup>th</sup> percentile, it ranges within its age norm. Scores lower than the 2.5<sup>th</sup> percentile are indicative of a dysfunction.
- (2) If the child scores below the 2.5<sup>th</sup> percentile, you can estimate its distance to the norm with the following formula:

$$\frac{(\text{median} - \text{the child's score})}{(\text{median} - 2.5^{\text{th}} \text{ percentile})}$$

A score of 1 equals the 2.5%-cut-off of the norm population. Scores higher than 1 indicate dysfunction, scores lower than 1 or negative scores indicate age-appropriate performance.

age	2.5 <sup>th</sup> %	median
5;0	0.66	0.95
5;1	0.68	0.95
5;2	0.69	0.95
5;3	0.70	0.96
5;4	0.72	0.96
5;5	0.73	0.96
5;6	0.74	0.97
5;7	0.75	0.97
5;8	0.76	0.97
5;9	0.77	0.97
5;10	0.78	0.97
5;11	0.79	0.98
6;0	0.80	0.98
6;1	0.80	0.98
6;2	0.81	0.98
6;3	0.82	0.98
6;4	0.83	0.98
6;5	0.83	0.99

**Example**

A child of 5 years and 3 months obtains an intelligibility score of 0.50. Comparison with the age-specific 2.5<sup>th</sup> percentile (0.70) shows that the child ranges below its age norm. The distance to the norm is calculated by applying the formula above:  $(0.96 - 0.50) / (0.96 - 0.70) = 1.77$ .

The same child is assessed again with 6 years and 3 months. It obtains an intelligibility score of 0.60, ranging clearly below the age-specific 2.5<sup>th</sup> percentile (0.82). The distance to the norm has become larger:  $(0.98 - 0.60) / (0.98 - 0.82) = 2.38$ .

	INTELLIGIBILITY			INTELLIGIBILITY			INTELLIGIBILITY			INTELLIGIBILITY		
	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median
[PROPORTION OF INTELLIGIBLE SYLLABLES]	3;0	0.09	0.66	5;0	0.66	0.95	7;0	0.88	0.99	9;0	0.95	1.00
	3;1	0.13	0.68	5;1	0.68	0.95	7;1	0.88	0.99	9;1	0.96	1.00
	3;2	0.16	0.71	5;2	0.69	0.95	7;2	0.89	0.99	9;2	0.96	1.00
	3;3	0.20	0.73	5;3	0.70	0.96	7;3	0.89	0.99	9;3	0.96	1.00
	3;4	0.23	0.75	5;4	0.72	0.96	7;4	0.89	0.99	9;4	0.96	1.00
	3;5	0.26	0.77	5;5	0.73	0.96	7;5	0.90	0.99	9;5	0.96	1.00
	3;6	0.29	0.78	5;6	0.74	0.97	7;6	0.90	0.99	9;6	0.96	1.00
	3;7	0.32	0.80	5;7	0.75	0.97	7;7	0.91	0.99	9;7	0.97	1.00
	3;8	0.35	0.82	5;8	0.76	0.97	7;8	0.91	1.00	9;8	0.97	1.00
	3;9	0.37	0.83	5;9	0.77	0.97	7;9	0.91	1.00	9;9	0.97	1.00
	3;10	0.40	0.84	5;10	0.78	0.97	7;10	0.92	1.00	9;10	0.97	1.00
	3;11	0.42	0.85	5;11	0.79	0.98	7;11	0.92	1.00	9;11	0.97	1.00
	4;0	0.45	0.86	6;0	0.80	0.98	8;0	0.92	1.00			
	4;1	0.47	0.87	6;1	0.80	0.98	8;1	0.93	1.00			
	4;2	0.49	0.88	6;2	0.81	0.98	8;2	0.93	1.00			
	4;3	0.51	0.89	6;3	0.82	0.98	8;3	0.93	1.00			
	4;4	0.53	0.90	6;4	0.83	0.98	8;4	0.94	1.00			
	4;5	0.55	0.91	6;5	0.83	0.99	8;5	0.94	1.00			
	4;6	0.57	0.91	6;6	0.84	0.99	8;6	0.94	1.00			
	4;7	0.59	0.92	6;7	0.85	0.99	8;7	0.94	1.00			
	4;8	0.60	0.93	6;8	0.85	0.99	8;8	0.95	1.00			
	4;9	0.62	0.93	6;9	0.86	0.99	8;9	0.95	1.00			
4;10	0.64	0.94	6;10	0.87	0.99	8;10	0.95	1.00				
4;11	0.65	0.94	6;11	0.87	0.99	8;11	0.95	1.00				

	ARTICULATION RATE [SYLL/S]											
	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median
	3;0	2.66	3.37	5;0	3.11	3.87	7;0	3.49	4.25	9;0	3.81	4.55
	3;1	2.68	3.39	5;1	3.13	3.89	7;1	3.50	4.27	9;1	3.82	4.56
	3;2	2.70	3.42	5;2	3.14	3.91	7;2	3.52	4.28	9;2	3.83	4.57
	3;3	2.72	3.44	5;3	3.16	3.93	7;3	3.53	4.30	9;3	3.85	4.58
	3;4	2.74	3.46	5;4	3.18	3.94	7;4	3.55	4.31	9;4	3.86	4.59
	3;5	2.76	3.49	5;5	3.19	3.96	7;5	3.56	4.32	9;5	3.87	4.60
	3;6	2.78	3.51	5;6	3.21	3.98	7;6	3.58	4.34	9;6	3.88	4.61
	3;7	2.80	3.53	5;7	3.23	3.99	7;7	3.59	4.35	9;7	3.89	4.62
	3;8	2.82	3.55	5;8	3.24	4.01	7;8	3.60	4.36	9;8	3.90	4.63
	3;9	2.84	3.57	5;9	3.26	4.03	7;9	3.62	4.37	9;9	3.92	4.64
	3;10	2.86	3.60	5;10	3.28	4.04	7;10	3.63	4.39	9;10	3.93	4.65
	3;11	2.87	3.62	5;11	3.29	4.06	7;11	3.64	4.40	9;11	3.94	4.66
	4;0	2.89	3.64	6;0	3.31	4.08	8;0	3.66	4.41			
	4;1	2.91	3.66	6;1	3.32	4.09	8;1	3.67	4.42			
	4;2	2.93	3.68	6;2	3.34	4.11	8;2	3.68	4.44			
	4;3	2.95	3.70	6;3	3.35	4.12	8;3	3.70	4.45			
	4;4	2.97	3.72	6;4	3.37	4.14	8;4	3.71	4.46			
	4;5	2.99	3.74	6;5	3.39	4.15	8;5	3.72	4.47			
	4;6	3.00	3.76	6;6	3.40	4.17	8;6	3.74	4.48			
	4;7	3.02	3.78	6;7	3.42	4.18	8;7	3.75	4.49			
	4;8	3.04	3.80	6;8	3.43	4.20	8;8	3.76	4.50			
	4;9	3.06	3.82	6;9	3.45	4.21	8;9	3.77	4.52			
	4;10	3.07	3.84	6;10	3.46	4.23	8;10	3.79	4.53			
	4;11	3.09	3.85	6;11	3.48	4.24	8;11	3.80	4.54			

SPEECH RATE [SYLL/S]	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median
	3;0	2.23	3.13	5;0	2.91	3.77	7;0	3.44	4.23	9;0	3.86	4.57
	3;1	2.27	3.16	5;1	2.93	3.79	7;1	3.46	4.25	9;1	3.88	4.58
	3;2	2.30	3.19	5;2	2.96	3.81	7;2	3.48	4.26	9;2	3.89	4.60
	3;3	2.33	3.22	5;3	2.98	3.83	7;3	3.50	4.28	9;3	3.91	4.61
	3;4	2.36	3.25	5;4	3.00	3.85	7;4	3.52	4.30	9;4	3.92	4.62
	3;5	2.39	3.28	5;5	3.03	3.87	7;5	3.54	4.31	9;5	3.94	4.63
	3;6	2.42	3.31	5;6	3.05	3.90	7;6	3.55	4.33	9;6	3.95	4.64
	3;7	2.45	3.33	5;7	3.07	3.92	7;7	3.57	4.34	9;7	3.97	4.65
	3;8	2.48	3.36	5;8	3.10	3.94	7;8	3.59	4.36	9;8	3.98	4.66
	3;9	2.50	3.39	5;9	3.12	3.96	7;9	3.61	4.37	9;9	4.00	4.68
	3;10	2.53	3.42	5;10	3.14	3.98	7;10	3.63	4.39	9;10	4.01	4.69
	3;11	2.56	3.44	5;11	3.17	4.00	7;11	3.65	4.40	9;11	4.03	4.70
	4;0	2.59	3.47	6;0	3.19	4.02	8;0	3.66	4.42			
	4;1	2.62	3.50	6;1	3.21	4.04	8;1	3.68	4.43			
	4;2	2.64	3.52	6;2	3.23	4.05	8;2	3.70	4.44			
	4;3	2.67	3.55	6;3	3.25	4.07	8;3	3.72	4.46			
	4;4	2.70	3.57	6;4	3.28	4.09	8;4	3.73	4.47			
	4;5	2.73	3.60	6;5	3.30	4.11	8;5	3.75	4.48			
	4;6	2.75	3.62	6;6	3.32	4.13	8;6	3.77	4.50			
4;7	2.78	3.65	6;7	3.34	4.15	8;7	3.78	4.51				
4;8	2.80	3.67	6;8	3.36	4.16	8;8	3.80	4.52				
4;9	2.83	3.70	6;9	3.38	4.18	8;9	3.82	4.54				
4;10	2.86	3.72	6;10	3.40	4.20	8;10	3.83	4.55				
4;11	2.88	3.74	6;11	3.42	4.21	8;11	3.85	4.56				

	FLUENCY QUOTIENT			FLUENCY QUOTIENT			FLUENCY QUOTIENT			FLUENCY QUOTIENT		
	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median
[SPEECH RATE / ARTICULATION RATE]	3;0	0.73	0.92	5;0	0.90	1.00	7;0	0.97	1.00	9;0	0.99	1.00
	3;1	0.74	0.93	5;1	0.91	1.00	7;1	0.97	1.00	9;1	0.99	1.00
	3;2	0.75	0.94	5;2	0.91	1.00	7;2	0.97	1.00	9;2	0.99	1.00
	3;3	0.76	0.95	5;3	0.92	1.00	7;3	0.97	1.00	9;3	0.99	1.00
	3;4	0.77	0.95	5;4	0.92	1.00	7;4	0.97	1.00	9;4	0.99	1.00
	3;5	0.78	0.96	5;5	0.92	1.00	7;5	0.97	1.00	9;5	0.99	1.00
	3;6	0.79	0.97	5;6	0.93	1.00	7;6	0.97	1.00	9;6	0.99	1.00
	3;7	0.80	0.97	5;7	0.93	1.00	7;7	0.98	1.00	9;7	0.99	1.00
	3;8	0.81	0.97	5;8	0.93	1.00	7;8	0.98	1.00	9;8	0.99	1.00
	3;9	0.82	0.98	5;9	0.94	1.00	7;9	0.98	1.00	9;9	0.99	1.00
	3;10	0.82	0.98	5;10	0.94	1.00	7;10	0.98	1.00	9;10	0.99	1.00
	3;11	0.83	0.98	5;11	0.94	1.00	7;11	0.98	1.00	9;11	0.99	1.00
	4;0	0.84	0.98	6;0	0.94	1.00	8;0	0.98	1.00			
	4;1	0.84	0.99	6;1	0.95	1.00	8;1	0.98	1.00			
	4;2	0.85	0.99	6;2	0.95	1.00	8;2	0.98	1.00			
	4;3	0.86	0.99	6;3	0.95	1.00	8;3	0.98	1.00			
	4;4	0.86	0.99	6;4	0.95	1.00	8;4	0.98	1.00			
	4;5	0.87	0.99	6;5	0.95	1.00	8;5	0.98	1.00			
	4;6	0.88	0.99	6;6	0.96	1.00	8;6	0.98	1.00			
	4;7	0.88	0.99	6;7	0.96	1.00	8;7	0.99	1.00			
	4;8	0.89	0.99	6;8	0.96	1.00	8;8	0.99	1.00			
	4;9	0.89	1.00	6;9	0.96	1.00	8;9	0.99	1.00			
4;10	0.90	1.00	6;10	0.96	1.00	8;10	0.99	1.00				
4;11	0.90	1.00	6;11	0.97	1.00	8;11	0.99	1.00				

COMMUNICATIVE EFFICIENCY [INTELLIGIBLE SYLLABLES / S]	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median	age	2.5 <sup>th</sup> %	median
	3;0	0.63	2.36	5;0	2.21	3.43	7;0	3.28	4.14	9;0	4.00	4.60
	3;1	0.71	2.42	5;1	2.27	3.47	7;1	3.32	4.16	9;1	4.03	4.62
	3;2	0.78	2.47	5;2	2.32	3.50	7;2	3.35	4.18	9;2	4.05	4.63
	3;3	0.86	2.52	5;3	2.37	3.54	7;3	3.39	4.20	9;3	4.08	4.65
	3;4	0.94	2.57	5;4	2.42	3.57	7;4	3.42	4.23	9;4	4.10	4.66
	3;5	1.01	2.62	5;5	2.47	3.60	7;5	3.46	4.25	9;5	4.12	4.67
	3;6	1.08	2.67	5;6	2.52	3.64	7;6	3.49	4.27	9;6	4.14	4.69
	3;7	1.16	2.72	5;7	2.57	3.67	7;7	3.52	4.29	9;7	4.17	4.70
	3;8	1.23	2.77	5;8	2.62	3.70	7;8	3.55	4.31	9;8	4.19	4.72
	3;9	1.30	2.82	5;9	2.66	3.73	7;9	3.59	4.33	9;9	4.21	4.73
	3;10	1.36	2.86	5;10	2.71	3.76	7;10	3.62	4.35	9;10	4.23	4.74
	3;11	1.43	2.91	5;11	2.76	3.79	7;11	3.65	4.37	9;11	4.25	4.76
	4;0	1.50	2.95	6;0	2.80	3.82	8;0	3.68	4.39			
	4;1	1.56	3.00	6;1	2.84	3.85	8;1	3.71	4.41			
	4;2	1.63	3.04	6;2	2.89	3.88	8;2	3.74	4.43			
	4;3	1.69	3.08	6;3	2.93	3.90	8;3	3.77	4.45			
	4;4	1.75	3.12	6;4	2.97	3.93	8;4	3.79	4.47			
	4;5	1.81	3.16	6;5	3.01	3.96	8;5	3.82	4.48			
	4;6	1.87	3.20	6;6	3.05	3.99	8;6	3.85	4.50			
4;7	1.93	3.24	6;7	3.09	4.01	8;7	3.88	4.52				
4;8	1.99	3.28	6;8	3.13	4.04	8;8	3.90	4.54				
4;9	2.05	3.32	6;9	3.17	4.06	8;9	3.93	4.55				
4;10	2.10	3.36	6;10	3.21	4.09	8;10	3.95	4.57				
4;11	2.16	3.39	6;11	3.25	4.11	8;11	3.98	4.58				