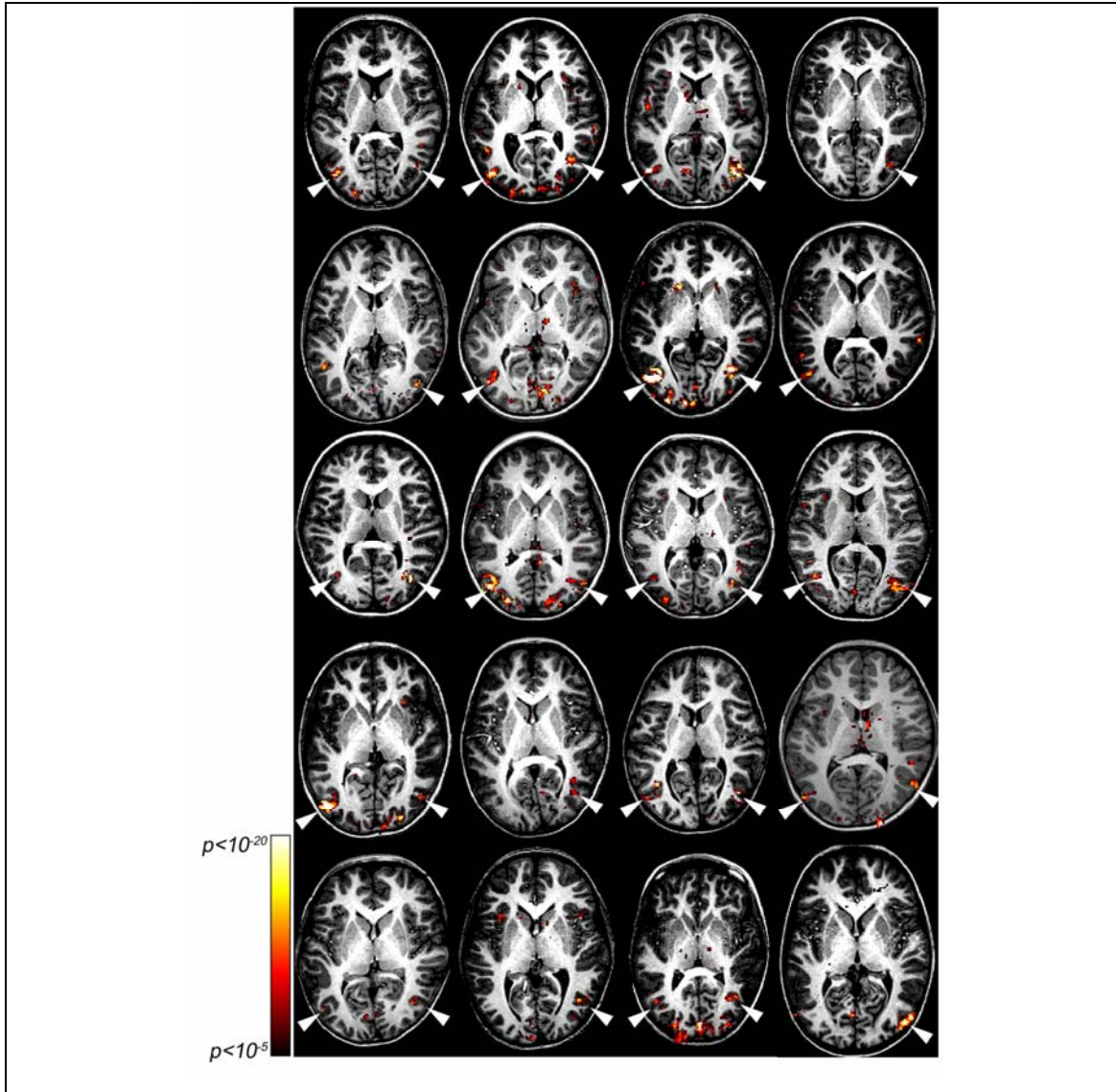# Supplemental material

Figure S1. MT+ activations in 20 children. The MT+ localizer compared moving patterns (at 1.8%, 6.8%, 25% contrast) against fixation. A single slice at the center of the left or right MT+ ROI is shown for each child (see arrowheads). Mean MNI coordinates of MT+ center of mass across all 35 children: LMT+: [-50, -74, 10]; RMT+: [48, -71, 7] (see text for more detail). The threshold is $p < 10^{-5}$ (uncorrected) for presentation purposes. In ROI definition, the threshold was lower ($p < 10^{-3}$) to ensure some MT+ activation is found in both hemispheres in all 35 subjects.
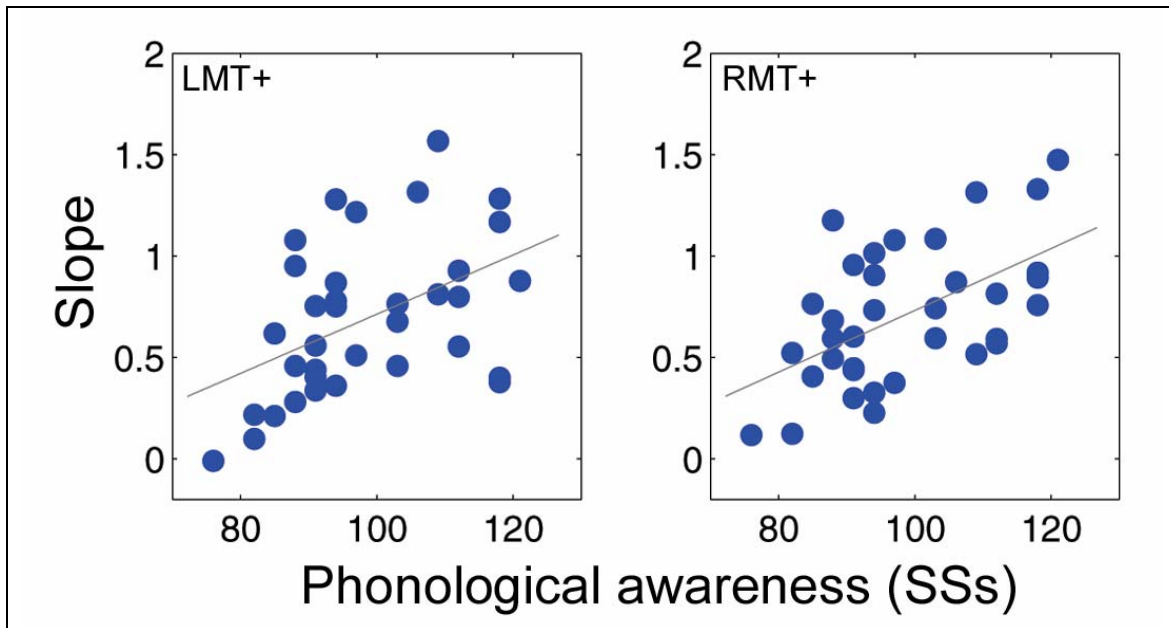
Figure S2. Contrast responsivity in left and right MT+ correlates with phonological awareness. The Y-axis shows the slope of a linear function through the mean BOLD contrast values plotted against log stimulus contrast. The X-axis shows phonological awareness Standardized scores (N=35). Shown in gray are linear regression lines through these values. The correlation between phonological awareness and contrast responsivity in left MT+ is r = 0.47 (p<0.005, uncorrected); in right MT+ the correlation is r = 0.55 (p<0.001 uncorrected).

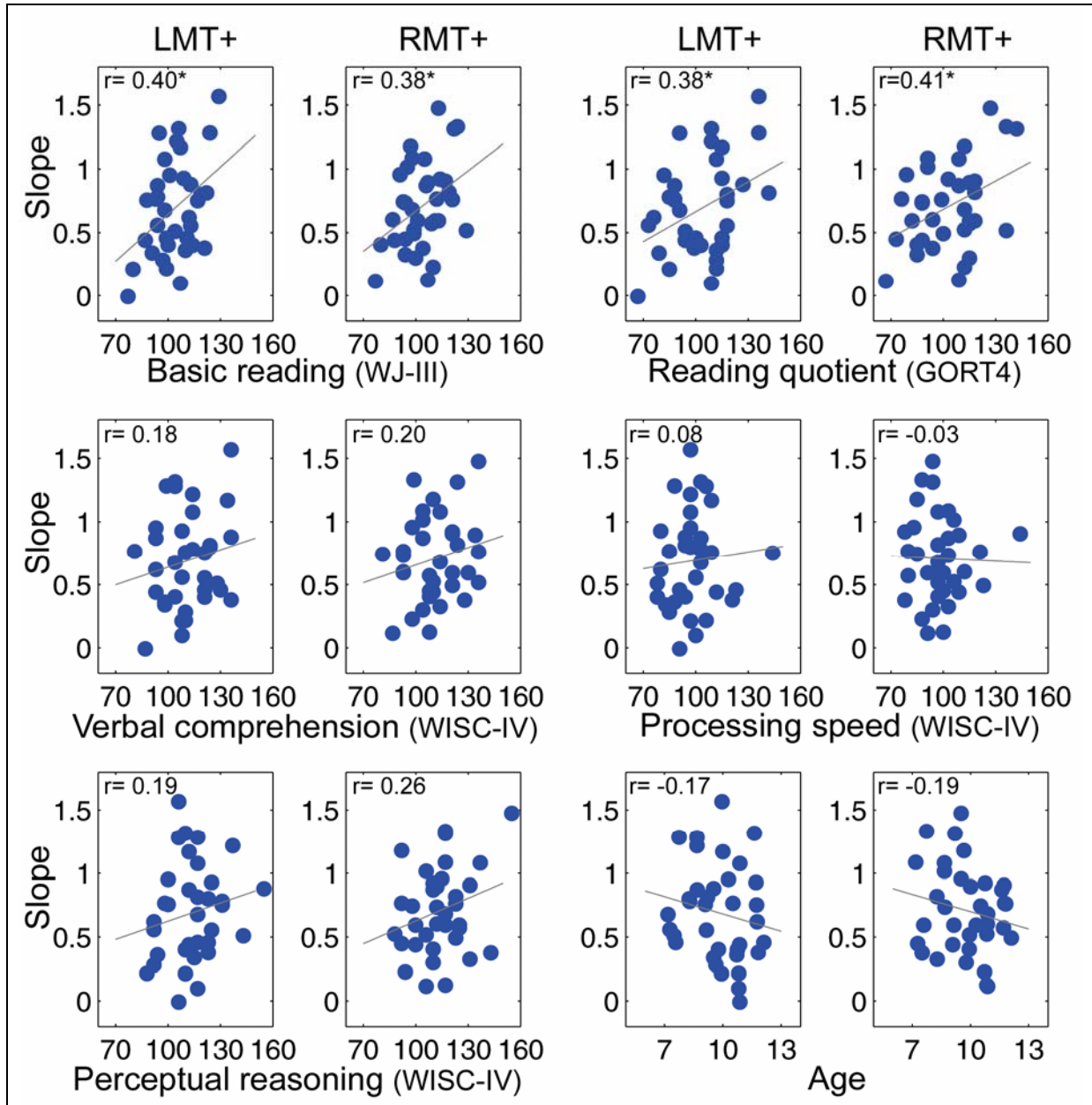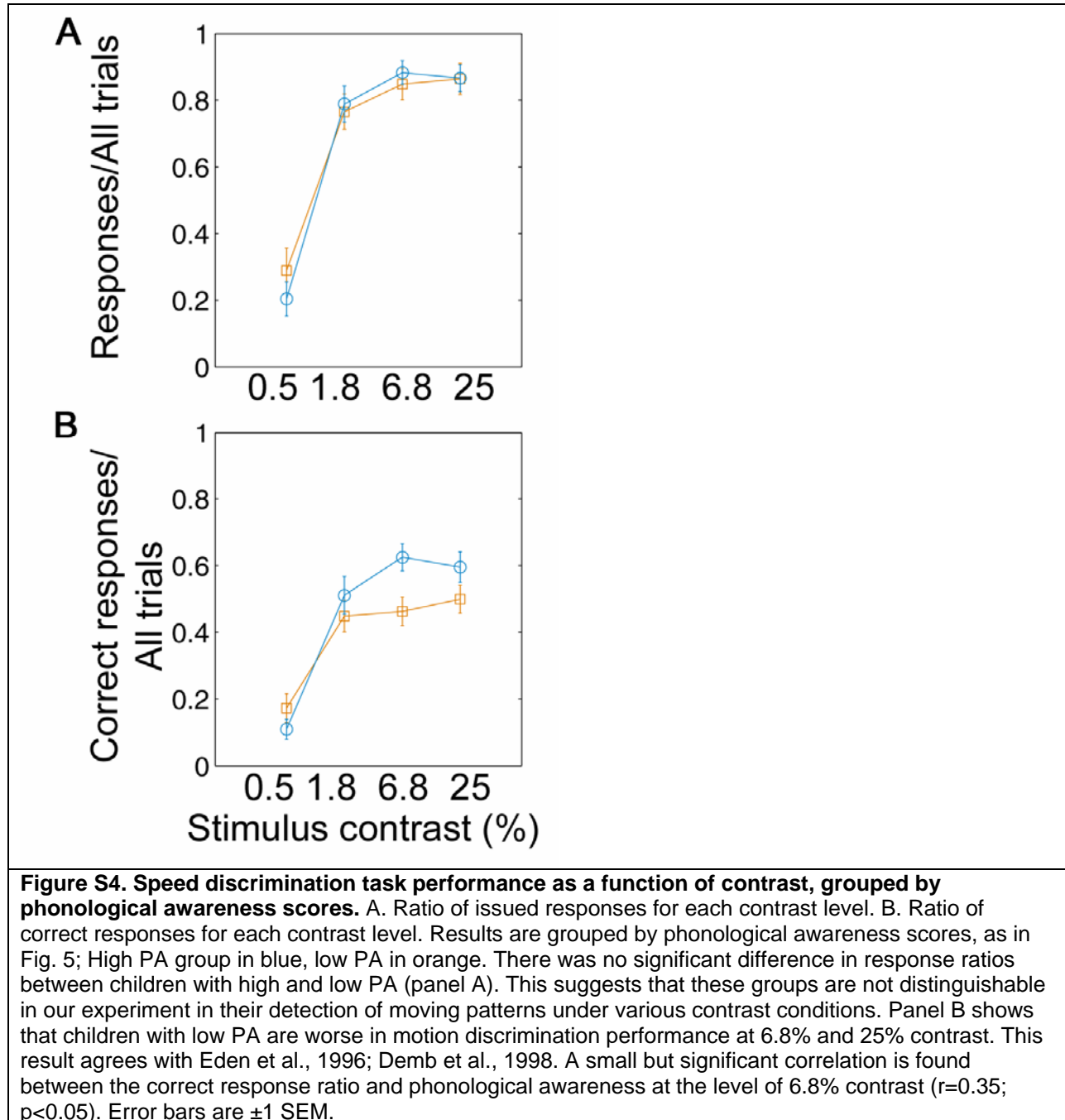**Figure S3. Correlations between contrast responsivity (slope) in left/right MT+ and neuropsychological measures.** Significant correlations (p<0.05, uncorrected) are marked with an asterisk.

Figure S4. Speed discrimination task performance as a function of contrast, grouped by phonological awareness scores. A. Ratio of issued responses for each contrast level. B. Ratio of correct responses for each contrast level. Results are grouped by phonological awareness scores, as in Fig. 5; High PA group in blue, low PA in orange. There was no significant difference in response ratios between children with high and low PA (panel A). This suggests that these groups are not distinguishable in our experiment in their detection of moving patterns under various contrast conditions. Panel B shows that children with low PA are worse in motion discrimination performance at 6.8% and 25% contrast. This result agrees with Eden et al., 1996; Demb et al., 1998. A small but significant correlation is found between the correct response ratio and phonological awareness at the level of 6.8% contrast (r=0.35; p<0.05). Error bars are ±1 SEM.
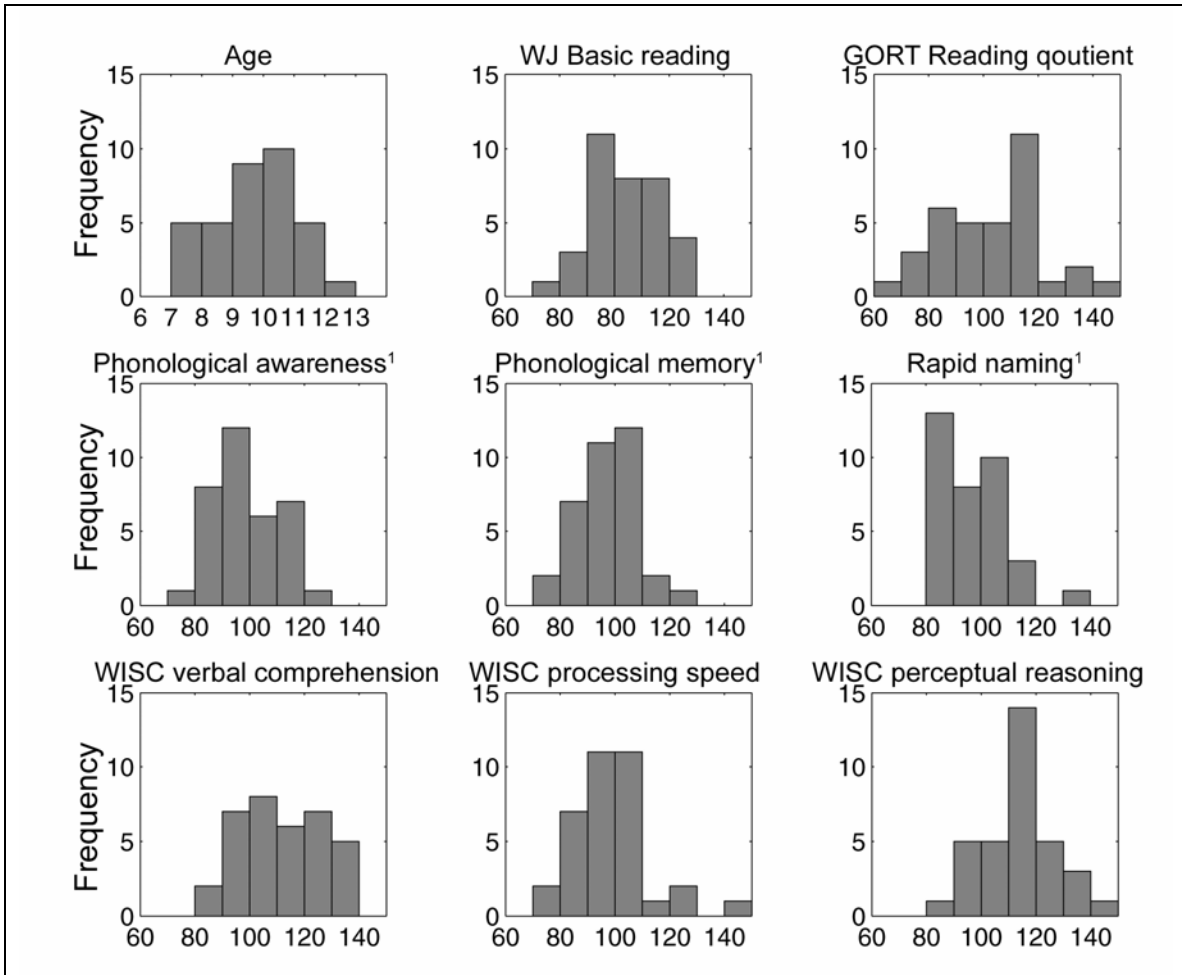
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Figure S5. Distributions of age and behavioral scores (standardized for age). [1]Measured with the CTOPP battery. For general descriptions of the test batteries refer to Table S1.

Table S1. Description of standardized tests and composite scores

Variable name	Test battery	Task	Example
Elision	CTOPP	Remove a phoneme from an aurally presented word, say the remaining word.	Say 'brand'. Now say brand without saying /r/. (band)
Blending	CTOPP	Combine sounds to form a word	What word do these sounds make? /b/-/oi/'. (boy)
Phonological Awareness	**CTOPP**	**Composite score: Elision + Blending**	
Memory for Digits	CTOPP	Repeat sequences of 2 to 8 non- repeating digits	Listen carefully and repeat: 7 3 2 5 9
Nonword Repetition	CTOPP	Repeat auditory pronounceable nonwords (pseudowords)	Listen to the made up word and repeat it: 'fos-ke-dool'
Phonological Memory	**CTOPP**	**Composite score: Memory for Digits + Nonword Repetition**	
Rapid Digit Naming	CTOPP	Name an array of 36 visual digits as fast as possible (Total time for two arrays)	
Rapid Letter Naming	CTOPP	Name an array of 36 visual letters as fast as possible (Total time for two arrays)	
Rapid Naming	**CTOPP**	**Composite score: Rapid Digit Naming + Rapid Letter Naming**	
Letter-Word Identification	WJ-III	Read aloud words of varying frequency, regularity and length	M … for … night … could … spoil …
Word Attack	WJ-III	Read aloud pronounceable pseudowords	dap… vek… koarb… knofe…
Basic Reading	**WJ-III**	**Composite score: Letter-Word Identification + Word Attack**	
Rate	GORT4	The time it takes to read a story	
Accuracy	GORT4	Accuracy in pronouncing the words in the story	
Fluency	GORT4	Composite score: Rate + Accuracy	
Comprehension	GORT4	Accuracy on comprehension questions regarding the story	
Oral reading quotient	**GORT4**	**Composite score: Fluency + Comprehension**	
Coding	WISC-IV	The time it takes to transcribe symbols and match them to digits	
Symbol Search	WISC-IV	The time it takes to search an array for matching symbols	
Processing Speed	**WISC-IV**	**Composite Score: Coding + Symbol Search**	
Matrix Reasoning	WISC-IV	Analyzing the relationship of patterns	
Block Design	WISC-IV	Arranging 2 color blocks to re-create a 2-dimensional design within a specified time limit	
Perceptual Reasoning	**WISC-IV**	**Composite Score: Matrix Reasoning + Block Design**	
Vocabulary	WISC-IV	Provide definitions for words that the examiner reads aloud.	
Similarity	WISC-IV	Describe the similarity between word pairs read aloud by the experimenter.	
Verbal comprehension	**WISC-IV**	**Composite Score: Vocabulary + Similarity**	

Table S2. Characteristics of the individuals shown in Figure 6

	Age	Gender	Phonological awareness	LMT+ slope	RMT+slope
S1	9.9	F	85	0.21	0.41
S2	9.8	F	91	0.40	0.30
S3	7.3	F	91	0.56	0.45
S4	10.9	M	91	0.44	0.60
S5	7.6	F	103	0.46	0.59
S6	7.2	F	103	0.68	1.08
S7	11.7	M	112	0.93	0.57
S8	9.5	F	121	0.88	1.48