**The measures included in PAL\_ClaytonHulme\_LSI.dta**

Ninety-seven children participated in the study and completed the following measures across six consecutive school days in 15-minute sessions.

**Measures and Procedure**

**Reading.** Children completed the sight word efficiency (SWE) and phonemic decoding efficiency (PDE) subtests from the Test of Word Reading Efficiency (TOWRE 2; Torgesen, Rashotte, & Wagner, 1999). In this task children were required to read as many words (SWE) or non-words (PDE) as possible in 45 seconds. Children also completed the Single Word Reading Test (SWRT6-16; Foster, 2007) in which they had to read aloud a list of words increasing in difficultly. Testing was discontinued after five consecutive incorrect responses. Estimates of reliability for these standardised measures of reading are .98 (Cronbach’s alpha) for the TOWRE-2 and .90 (test-retest) for the SWRT6-16.

**PAL Tasks.** Children completed six PAL tasks (phoneme-phoneme, visual-phoneme, nonverbal-nonverbal, visual-nonverbal, nonword-nonword and visual-nonword) each presented as a computerised game. In each task, children were presented with four pairs of items to learn. In the visual-articulatory PAL tasks (visual-phoneme, visual-nonverbal, visual-nonword) an unfamiliar symbol was presented on the computer screen and children were required to say the corresponding target sound (phoneme, non-word or nonverbal sound) paired with that symbol. In auditory-articulatory PAL tasks (phoneme-phoneme, nonverbal-nonverbal, nonword-nonword) the auditory target stimulus was played and children were required to produce the corresponding paired sound. The nonverbal articulatory sounds included nonspeech sounds such as ‘lip pop’ or ‘cough’. The children were tested on six consecutive school days for approximately 15-minutes and completed one PAL condition on each day, as well as a standardised task from the test battery. The sequence of conditions was counterbalanced using a Latin square. The programme randomly generated stimulus pairs for each child across the conditions.

Each of the six PAL tasks involved the child learning to produce the correct sound (a phoneme, nonword or nonspeech sound) in response to a visual stimulus (a letter-like form) or an auditory stimulus (a phoneme, nonword or nonspeech sound). In each condition, before teaching the child any associations between item pairs, the child was presented with each of the auditory stimuli used in that task and asked to reproduce it (they were required to repeat one at a time the 4 auditory stimuli used in each of the visual-articulatory conditions; or the 8 auditory stimuli used in each of auditory-articulatory conditions). In the rare event that a child had difficulty articulating one of the auditory stimuli, the experimenter provided a correct demonstration and asked the child to try again. After this, children moved on to the learning trials. These began with a single presentation of each of the four pairs of stimuli the children were to learn. Children then received 24 test-study trials. On test-study trials children were presented with each of the 4 stimuli and were required to produce the corresponding paired response sound. After the child responded (irrespective of whether the child’s response was correct or incorrect) the correct pairing was re-presented to reinforce learning. Children’s responses were recorded for each trial (correct, incorrect, no response).

***Stimuli.***Visual stimuli were 12 unfamiliar symbols (pixel size 800 x 600) adapted from Taylor, Plunkett, and Nation (2011). These stimuli are listed in the Appendix. All auditory stimuli were recorded by a female native English speaker in a sound attenuated booth and included 12 phonemes, 12 non-verbal sounds and 12 non-words. Non-verbal sounds were adapted from Vellutino et al. (1975) and consisted of sounds that did not involve phonemes and could be easily produced. These sounds were; high hum, low hum, smooch, raspberry, cough, blow, pop with lips, gasp, tut, tongue click, sigh and sucking front teeth. Phonemes consisted of: /kə/, /bə/, /pə/, /fə/, /gə/, /nə/, /rə/, /sə/, /wə/, /lə/, /jə/ and /mə/. Non-words were consonant-vowel-consonant (CVC) non-words, taken from the ARC Nonword Database (Rastle, Harrington, & Coltheart, 2002) as used in previous PAL studies (e.g. Litt et al., 2013):/hɪb/, /dʒɒf/, /kæg/, /kæv/, /lɒm/, /mɪb/, /næl/, /pel/, /tʌs/, /vek/, /jɪz/, /jʌt/.