

## Technical Appendix

### Definition

Phonics is an approach to teaching reading, and some aspects of writing and spelling, by developing learners' phonemic awareness. In linguistics, a phoneme is the smallest unit of speech that can be used to make one word different from another word. Phonics approaches therefore involve the skills of hearing, identifying and using sound patterns or phonemes in English. The aim is to teach learners the relationship between these sounds and the written spelling patterns, or graphemes, which represent them. Phonics emphasises the skills of decoding new words by sounding them out and combining or 'blending' the sound-spelling patterns. There are two main approaches to teaching phonics: analytic and synthetic phonics. In both approaches the learner needs to have some phonological awareness (the ability to hear and discriminate sounds in spoken words). Synthetic phonics focuses on the development of phonemic awareness as a key skill. To learn to decode written text into sounds, a reader is taught up to 44 phonemes (the smallest units of sound) and their related graphemes (the written symbols for these phonemes). Analytic phonics, also sometimes known as the "whole word" approach, involves analysis of whole words to detect phonetic or orthographic (spelling) patterns, then splitting them into smaller parts and sounding these out to help with the decoding process.

Search terms: Phonics, analytic\* phonics, synthetic phonics, phonemic awareness.

### Evidence Rating

There are seven meta-analyses and one best-evidence synthesis with quantitative estimates of impact on attainment (effect sizes). Five of the meta-analyses have been conducted in the last ten years. There is high quality evidence in these syntheses where the majority of the included studies have ecological validity and where the outcome measures include curriculum measures or standardised tests in school subject areas. The pooled effect size estimates range from 0.24 to 0.62, with some of the variation explained by intensity (particularly one-to-one and small group) and outcome measures (higher effects for word level measures and lower for comprehension). Overall the evidence is rated as very extensive.

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## Summary of effects

Meta-analyses	Effect size	FSM effect size	
Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S., (2008)	0.24	-	
Ehri, C.L., Nunes, S.R., Stahl, S.A., & Willows, D.M., (2001)	0.41	0.66	
Galuschka K, Ise E, Krick K, Schulte-Körne G , (2014)	0.32	-	
Jeynes, W.H., (2008)	0.30	-	
McArthur G, Eve PM, Jones K, Banales E, Kohnen S, Anandakumar T, Larsen L, Marinus E, Wang HC, Castles A., (2012)	0.47	-	Word reading accuracy
	0.14	-	Reading comprehension
Sherman, K. H., (2007)	0.39	-	(older readers)
Slavin, R. E., Lake, C., Davis, S., & Madden, N. A., (2011)	0.62	-	(one to one phonics tutoring)
	0.35	-	(small group phonics)
Torgerson, C., Brooks, G., & Hall, J., (2006)	0.27	-	
Single Studies	Effect size	FSM effect size	
Gorard, S., See, B. H., & Siddiqui, N. (2014)	0.24	0.36	
Gorard, S., Siddiqui, N. & See, B.H. (2015)	0.24	0.24	(limited security in this finding due to nature of the study)
King, B. & Kasim, A. (2015)	-0.07	-0.07	
Merrell, C. & Kasim, A. (2015)	0.43	0.16	(limited security in this finding due to nature of the study)
Sheard, M., Chambers, B. & Elliott, L. (2015)	-0.08	-0.21	(limited security in this finding due to nature of the study)
<b>Weighted mean effect size</b>	<b>0.35</b>		

The right hand column provides detail on the specific outcome measures or, if in brackets, details of the intervention or control group.

## Meta-analyses abstracts

### 2 Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S. (2008)

Examined the findings of the "Teaching Children To Read" study of the National Reading Panel and the procedures of the study. Meta-analytic techniques found that the methodology and procedures were not adequate. Findings suggest that phonics, as an aspect of the complex reading process, should not be over-emphasized.

### 4 Ehri, C.L., Nunes, S.R., Stahl, S.A., & Willows, D.M. (2001)

A quantitative meta-analysis evaluating the effects of systematic phonics instruction compared to unsystematic or no-phonics instruction on learning to read was conducted using 66 treatment-control comparisons derived from 38 experiments. The overall effect of phonics instruction on reading was moderate,  $d = 0.41$ .

5 *Galuschka K, Ise E, Krick K, Schulte-Körne G (2014)*

Children and adolescents with reading disabilities experience a significant impairment in the acquisition of reading and spelling skills. Given the emotional and academic consequences for children with persistent reading disorders, evidence based interventions are critically needed. The present meta-analysis extracts the results of all available randomized controlled trials. The aims were to determine the effectiveness of different treatment approaches and the impact of various factors on the efficacy of interventions. The literature search for published randomized-controlled trials comprised an electronic search in the databases ERIC, PsycINFO, PubMed, and Cochrane, and an examination of bibliographical references. To check for unpublished trials, we searched the websites clinicaltrials.com and ProQuest, and contacted experts in the field. Twenty-two randomized controlled trials with a total of 49 comparisons of experimental and control groups could be included. The comparisons evaluated five reading fluency trainings, three phonemic awareness instructions, three reading comprehension trainings, 29 phonics instructions, three auditory trainings, two medical treatments, and four interventions with coloured overlays or lenses. One trial evaluated the effectiveness of sunflower therapy and another investigated the effectiveness of motor exercises. The results revealed that phonics instruction is not only the most frequently investigated treatment approach, but also the only approach whose efficacy on reading and spelling performance in children and adolescents with reading disabilities is statistically confirmed. The mean effect sizes of the remaining treatment approaches did not reach statistical significance. The present meta-analysis demonstrates that severe reading and spelling difficulties can be ameliorated with appropriate treatment. In order to be better able to provide evidence-based interventions to children and adolescent with reading disabilities, research should intensify the application of blinded randomized controlled trials.

8 *Jeynes, W.H. (2008)*

This meta-analysis of 22 studies examines the relationship between phonics and the academic achievement of urban minority elementary school children. Further analyses distinguish between those studies that are of higher quality than the others and those studies that examine all minority students and mostly minority students. Results indicate a significant relationship between phonics instruction and higher academic achievement. Phonics instruction, as a whole, is associated with academic variables by about .23 to .33 of a standard deviation unit. This relationship holds for studies that examine all minority students and those that include mostly minority students. The results also hold for higher quality studies. The significance of these results is discussed.

10 *McArthur G, Eve PM, Jones K, Banales E, Kohnen S, Anandakumar T, Larsen L, Marinus E, Wang HC, Castles A. (2012)*

Around 5% of English speakers have a significant problem with learning to read words. Poor word readers are often trained to use letter-sound rules to improve their reading skills. This training is commonly called phonics. Well over 100 studies have administered some form of phonics training to poor word readers. However, there are surprisingly few systematic reviews or meta-analyses of these studies. The most well-known review was done by the National Reading Panel (Ehri 2001) 12 years ago and needs updating. The most recent review (Suggate 2010) focused solely on children and did not include unpublished studies. Objectives: The primary aim of this review was to measure the effect that phonics training has on the literacy skills of English-speaking children, adolescents, and adults whose reading was at least one standard deviation (SD), one year, or one grade below the expected level, despite no reported problems that could explain their impaired ability to learn to read. A secondary objective was to explore the impact of various factors, such as length of training or training group size, that might moderate the effect of phonics training on poor word reading skills. Search methods. Selection criteria: We included studies that use randomisation, quasi-randomisation, or minimisation to allocate participants to either a phonics intervention group (phonics alone, phonics and phoneme awareness training, or phonics and irregular word reading training) or a control group (no training or alternative training, such as maths). Participants were English-speaking children, adolescents, or adults whose word reading was below the level expected for their age for no known reason (that is, they had adequate attention and no known physical, neurological, or psychological problems). Data collection and analysis. Two review authors independently selected studies, assessed risk of bias, and extracted data. Main results. We found 11 studies that met the criteria for this review. They involved 736 participants. We measured the effect of phonics training on eight outcomes. Authors' conclusions. Phonics training appears to be effective for improving some reading skills. Specifically, statistically significant effects were found for nonword reading accuracy (large effect), word reading accuracy (moderate effect), and letter-sound knowledge (small-to-moderate effect). For several other outcomes, there were small or moderate effect sizes that did not reach statistical significance but may be meaningful: word reading fluency, spelling, phonological output, and reading comprehension. The effect for nonword reading fluency, which was measured in only one study, was in a negative direction, but this was not statistically significant.

15 *Sherman, K. H. (2007)*

The purpose of this study was to synthesize, using meta-analytical methods, the research regarding phonemic awareness and phonics (decoding) instruction with students in grades 5 through 12 who read significantly below grade level expectations. Twenty-six studies published between 1975 and 2005 met the criteria for inclusion and analysis. A total of 1358 students participated in the studies (565 in control groups, 799 in treatment groups). The effect sizes of interventions = impact on achievement were calculated on five levels of dependent variables (word identification or word attack skills of sub-syllabic or single syllable levels, and decoding multi-syllabic words; oral reading fluency and accuracy of individual words or connected text; comprehending words or vocabulary; comprehending text; decoding, fluency and comprehension). Four separate analyses were presented: (a) the full data set; (b) the data set with outliers removed; (c) the full data set without one study (Mercer, Miller, Mercer, & Lane, 2000); and (d) the data without outliers and without the Mercer study. Although many of the studies exhibited medium to high effect sizes, none of the analyses at an alpha level of 0.05 reached statistical significance. Because of the small number of studies and the variability of the population studied, the alpha level was relaxed to 0.25 to explore statistical significance of main effects or interaction effects at this level. The impact of group size and reading level on effect size was significant in many of the analyses at a 0.25 alpha level. The results were mixed for group size/intervention focus and reading level/intervention focus. Significant main effects were found for reading level (reading level\*intervention focus) and the interaction between group size and intervention focus on word identification or word attack skills of sub-syllabic or single syllable levels, and decoding multi-syllabic words. The impact of reading level, group size, and intervention focus on effect size were not significant at any level. Limitations of this meta-analysis, features of interventions that show promise in accelerating the reading skills of delayed older readers, and suggestions for future research are also presented.

16 *Slavin, R. E., Lake, C., Davis, S., & Madden, N. A. (2011)*

This article reviews research on the achievement outcomes of alternative approaches for struggling readers ages 5–10 (US grades K–5): One-to-one tutoring, small-group tutorials, classroom instructional process approaches, and computer-assisted instruction. Study inclusion criteria included use of randomized or well-matched control groups, study duration of at least 12 weeks, and use of valid measures independent of treatments. A total of 97 studies met these criteria. The review concludes that one-to-one tutoring is very effective in improving reading performance. Tutoring models that focus on phonics obtain much better outcomes than others. Teachers are more effective than paraprofessionals and volunteers as tutors. Small-group, phonetic tutorials can be effective, but are not as effective as one-to-one phonetically focused tutoring. Classroom instructional process programs, especially cooperative learning, can have very positive effects for struggling readers. Computer-assisted instruction had few effects on reading. Taken together, the findings support a strong focus on improving classroom instruction and then providing one-to-one, phonetic tutoring to students who continue to experience difficulties.

19 *Torgerson, C., Brooks, G., & Hall, J. (2006)*

Executive Summary The Department for Education and Skills (DfES) commissioned the Universities of York and Sheffield to conduct a systematic review of experimental research on the use of phonics instruction in the teaching of reading and spelling. This review is based on evidence from randomised controlled trials (RCTs). Key findings. The effect of phonics on reading: Systematic phonics instruction within a broad literacy curriculum was found to have a statistically significant positive effect on reading accuracy. There was no statistically significant difference between the effectiveness of systematic phonics instruction for reading accuracy for normally-developing children and for children at risk of reading failure. The weight of evidence for both these findings was moderate (there were 12 randomized controlled trials included in the analysis). Both of these findings provided some support for those of a systematic review published in the United States in 2001 (Ehri et al., 2001). An analysis of the effect of systematic phonics instruction on reading comprehension was based on weak weight of evidence (only four randomized controlled trials were found) and failed to find the statistically significant positive difference which was found in the previous review. The effect of synthetic and analytic phonics: The weight of evidence on this question was weak (only three randomized controlled trials were found). No statistically significant difference in effectiveness was found between synthetic phonics instruction and analytic phonics instruction. The effect of phonics on spelling: The weight of evidence on this question was weak (only three randomized controlled trials were found). No effect of systematic phonics instruction on spelling was found.