

# Can Older Pupils, Who Do Not Present as Struggling Readers, Improve Their Basic Decoding Skills Through Systematic Phonics Instruction and What Effect Does This Have on Their Reading Fluency and Comprehension?

Dr. Timothy Mills\*

St. Mary's University, Waldegrave Road, TW1 4SX.

\*Corresponding author address: 4 Radcliffe Mews, London, TW12 1LN. Email: timothymills@me.com

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## Abstract

*The suggestion that phonics should be fast and first [1] implies that if code knowledge is not mastered in the first years of schooling, then any residual knowledge deficit beyond this may be difficult to overcome. If phonics is a boat that must be caught early, then what are the effects on reading when the boat is missed? This paper reports on the findings from an investigation into whether a systematic phonics intervention for older pupils with a deficit in their basic decoding skills but who were not evaluated as struggling readers, improved pupils' basic decoding skills and whether any improvements in these skills resulted in improvements in reading fluency and comprehension. The study followed convenience sample of 125 pupils in four English primary schools from the beginning of their entry into year 5 (aged 9) and concluded at the end of year 6 – their final year in English primary school (aged 10/11). All pupils were assessed at the beginning of year 5 in their basic decoding skills, word recognition, reading fluency and reading comprehension and were assessed again after three and a half terms. An intervention group of 91 pupils received thrice-weekly systematic phonics instruction for three and a half terms. A comparison group of 34 pupils did not receive the intervention. The results from the study indicated that, contrary to previous suggestions, basic decoding skills in older pupils can be improved through regular systematic phonics instruction and that the resultant improvements in code knowledge appeared to have a positive effect on word recognition, reading accuracy, reading rate and reading comprehension compared with no specific instruction. The study concluded that where older pupils lack comprehensive basic decoding skills, a programme of systematic code instruction which remedies this deficit should be introduced.*

**Keywords:** Phonics; automaticity; fluency.

## Implications for Practice

What is already known about this topic:

- There is a substantial body of research which has indicated that code-based early reading instruction in English has significant benefits for the development of reading fluency and comprehension as readers develop.
- Phonics instruction is recommended to be 'first and fast' [1] with The Phonics Screening Check [2] applied at the end of Year 1 in England.
- There have been recommendations that for older children who have failed to master the English phonic code, an alternative instructional model is required.

What this paper adds:

- The vast majority of research into older children's reading focuses on children with chronic reading debilities. This study has focused on children without comprehensive code knowledge but who do not present as readers with significant debilities.
- The results suggested that significant code knowledge, rather than comprehensive code knowledge, is sufficient for fluency to develop.
- The data suggest that older children can benefit from a systematic approach to code instruction which can lead to gains in fluency and comprehension.

Implications for theory, policy, or practice:

- Screening pupils beyond the Phonic Screening Check [2] for a comprehensive knowledge of the code would identify where code deficits should be addressed.
- Teachers in the upper years of primary education would benefit from training in systematic phonic teaching particularly where it pertains to word attack strategies.

## Introduction

In 2020 the Education Endowment Foundation (EEF) [3] stated in their online phonic toolkit that, 'For older readers who are struggling to develop reading skills, phonics approaches may be less successful...children aged 10 or above who have not succeeded using phonics approaches previously require a different approach...'. They cited Ehri (2004) [4], who suggested that the teaching of phonics to older pupils was undermined by pupils' reliance on absorbed, inefficient compensatory strategies that were problematic to reverse. The EEF's (2020) conclusion, however, does not align with Beck's (1998) assertion that phoneme to grapheme mapping is to reading as the skill of dribbling is to basketball: crucial knowledge necessary to play the game. The implication from Beck (1998) appeared to be that without sufficient phonic knowledge, reading was not possible. This presents a dilemma for older readers who have failed to master basic

decoding skills in earlier years: without phonics mastery, reading fluency would not be possible, but the teaching of phonic strategies to older pupils has suspect efficacy.

The suggestion that phonics should be fast and first [1] implies that if code knowledge is not learned in the first years of schooling, then any knowledge deficit may be difficult to overcome as children mature. Glazzard (2017) [5] argued that if a child has received phonics instruction from aged five to seven and was still struggling to read then more phonics instruction was irrational; something different would be needed and not more of what had already failed. Ehri (2004) [4] suggested that beyond the age of seven, phonics instruction must be combined with other forms of reading instruction if maximum impact were to be attained. This contradicted the 'Simple View of Reading' [6] which concluded that decoding ability and language comprehension were both required for reading comprehension and that gains in one area could not compensate for deficits in the other. Ehri (2004) [4] made her supposition directly from effect sizes but conceded that there existed a paucity of research in the field. She surmised that the diminishing effect sizes for phonics instruction in older pupils may have been a result of the difficulties in altering students' habits and the complexities of unravelling acquired, inefficient compensatory strategies employed when attacking unknown words. Gray, et al. [7] also found that for older children, SSP appeared less effective although the older pupils in their study were in secondary schools and were children with Special Educational Needs specifically relating to reading.

Although research into the teaching of phonics beyond the age of seven is not substantial, inferences can be drawn from wider studies on older readers. 'The Reading First Program', a reading intervention for struggling readers, established as part of the 'No Child Left Behind' (2001) [8] legislation in the United States, included substantial decoding instruction for seven and eight-year-olds. The impact on reading fluency and comprehension was poor. However, the effect on decoding was significant and positive [9]. Further indication that phonics instruction in later years may be effective can be implied from research into a thirty-week intervention for forty-five eight-year-old children who were identified with reading problems [10]. Although the intervention included both fluency and comprehension instruction, the early weeks were weighted heavily in favour of phonemic awareness and letter-sound relationships. Seventy-six per cent of the sample met the success criteria at the end of the phonics element of the intervention and further monitoring indicated that of those, 70% went on to become successful readers.

McCandliss et al.'s (2003) [11] study of seven-year-olds whose word-attack strategy relied on initial consonant decoding also indicated that interventions that focused on phonemic manipulation resulted in participants significantly outperforming the comparison group in decoding assessments. These results were supported by a study into word building interventions that focused on older participants writing letters to form words rather than focusing on speech activities. The pairing of orthography and phonology was crucial, the study

concluded, to enhance the knowledge of phonemic structure. A study of third grade children who were in the bottom 20% of readers [12] found that after a year's intervention they had made significant gains compared to the comparison group. The intervention included substantial elements of sound to symbol correspondence instruction and the use of texts controlled for those learned correspondences. The positive effects were evident one year after the intervention and a follow up study ten years later also suggested moderate effect sizes and benefits [12].

Edwards' (2006) [13] small scale action research study of sixteen 14 to 16-year-olds reported significant improvements in word reading following a systematic phonics intervention. These results were supported by Jeffes' (2016) [14] phonics-based intervention for 30 secondary pupils which showed significant improvements in decoding and word recognition for participants. Jennings' (2008) [15] research study noted that many pupils enter KS2 with, 'much of the phonics input from KS1 still unlearned...' (2008:32). The study also found that polysyllabic decoding was often the most in deficit. The study provided phonics intervention for 16 Year 5 children with the most pronounced shortfall finding that they made four times the progress of the average child. Jennings (2008) noted, however, that the intervention was not a pure phonics intervention, that the pupils had been taught early reading under the National Literacy Strategy [16] and thus had not been exposed to Systematic Synthetic Phonics (SSP) and that the study focused on readers with chronic reading issues and had a very small sample size.

A meta-analysis of research into interventions for struggling older readers by Flynn et al. (2012) [17] indicated significant effect sizes for the phonics interventions included. However, these only included very small samples with pupils with severe reading debilities and focused more on the intervention structure than the content. Results from a meta-analysis that included adolescents with reading difficulties, concluded that phonics training for poor readers was effective [18]. This was supported by a further meta-analysis of randomised controlled studies that included adolescents and found that only phonics instruction produced significant positive effect sizes [19]. The study concluded that systematic instruction in letter-sound correspondences and decoding strategies were the most effective for improving literacy skills for children and adolescents with reading difficulties.

Gorard, et al. (2015) [20] studied 433 pupils who had recently entered the English secondary school system (aged 11) but had achieved below the expected English standard, so were not necessarily classified as having a reading debility. Two hundred and twelve pupils were removed from their English lessons for three hours every week for 22 weeks, and in small groups received phonics and word recognition practice. The study found that the intervention group made the equivalent of three months additional progress in standardised comprehension scores compared to the comparison group and concluded that there was considerable promise from using phonics as an

intervention for these older pupils. The inclusion of pupils who had performed below the expected attainment levels at the end of KS2 (aged 10/11) implied that, like this study, many may not have been defined as struggling readers is perhaps pertinent for this research.

The growing recognition that many reading difficulties are revealed beyond the early years of schooling [21] has not corresponded with research studies in this area [9]. However, Leach et al. (2003) [22] studied older pupils with late-emerging reading difficulties (eight and nine-year-olds) and concluded that deficits in word recognition, decoding and spelling were significant impediments to progress in reading achievement beyond early school grades. They suggested that late emerging reading difficulties were being overlooked by educators and that more forensic assessment protocols were required by schools. Summarising the findings of research into struggling readers, particularly in later years, Kucan and Palincsar (2011) [9] conclude that, ‘We need to focus our efforts on minimizing the bottle-neck effects of the decoding problems experienced by some struggling readers...’ (2011: 354).

In 2021 the EEF revised their aforementioned advice referenced in the introduction and removed the statement from their website. They commissioned a research study into a commercial phonics intervention for older pupils. The results suggested that those pupils in receipt of the intervention made less reading progress than those who did not receive it and the study [3]. However, Gorard [23] suggested that the study had a low trustworthy rating and was a failed trial. Part of the failure was attributed to the lack of fidelity of delivery of the programme and the assessments associated with it. The EEF concluded that, ‘Going forward, we need more research around the impact phonics can have on older pupils. Building the evidence base further will help us understand the impact that phonics approaches have on this age group [3].

**Method**

**Participants**

The sample was a convenience sample and consisted of 125 year 5 pupils (who entered year 5 in September 2017) in four schools

in a single educational trust. All of the pupils were assessed prior to the study and revealed some deficit (though not chronic) in basic decoding skills. All four schools were situated in England and were part of a charitable trust and were situated in areas with deprivation factors of between .43 and .47 which was double the national average (Indices of Deprivation 2015 and 2019, 2020). All four schools had pupils that generated Pupil Premium Grant (PPG) funding of between 49% and 58%, significantly above the national average of 31% [24]. Three of the schools had been placed in ‘Special Measures’ by Ofsted in the previous five years with one receiving a ‘Requires improvement’ judgement. All four schools recorded KS2 National Curriculum assessment reading results below the national average for the two years prior to the study. All four schools adopted a similar approach to daily reading instruction and followed similar curricula. In the case of this study, randomised selection of individual pupils was not possible because groups within the sample were already intact in the form of classes predetermined by the schools. The intervention was structured on a whole-class model of instruction, so it was necessary for pupils to remain in pre-determined groupings (classes). As a result of a lack of randomisation, a ‘true’ experimental approach was undermined, and a quasi-experimental approach was necessarily adopted.

The study followed the pupils in the sample from September 2017 for two years until they sat their KS2 National Curriculum Tests in May 2019. The pupils were assessed as to their knowledge of the English phonic code, their automatic word recognition, their reading fluency and their reading comprehension in the autumn term of 2017 and again in the autumn term of 2018. Pupils sat the KS2 National Curriculum assessments in May 2019 and their reading data were available to the study.

An intervention group received systematic phonics instruction in three half-hour sessions for three and a half terms. A comparison group followed the same curriculum and daily reading instruction model as the intervention group but did not receive the thrice weekly phonics instruction.

**Table 1:** Demographic Characteristics of intervention and comparison groups.

Baseline Characteristic	INTERVENTION GROUP n %	COMPARISON GROUP n %	FULL SAMPLE n %	NATIONAL FIGURES (2017) %
<i>Economic Status</i>				
PPG funding	40 44	20 59	60 48	31
Non-PPG funding	51 56	14 41	65 52	69
<i>Language status</i>				
English as an additional language (EAL)	40 44	10 29	50 40	20
English as a first language	51 56	24 71	75 60	80
<i>Educational need status</i>				
On the SEND register	17 19	8 24	25 20	14
Not on the SEND register	74 81	26 76	100 80	86
<i>PPG- Pupils in receipt of the Pupil Premium Grant.</i>				
<i>EAL= Pupils with English as an Additional Language.</i>				
<i>SEND=Pupils on the Special Educational Needs and Disabilities register (including those with Education and Healthcare Plans).</i>				

The schools from which the comparison group was comprised were the only two schools that agreed to be part of the study but did not wish to offer their pupils the intervention. The intervention group was consequently larger than the comparison group. Ninety-one pupils from five classes across two schools formed the intervention group. Thirty-four pupils from two classes across two schools made up the comparison group. All four schools followed a similar curriculum, potentially reducing endogenous variables across the study. All pupils engaged in 45 minutes of whole class reading every morning with the use of the same text across all four schools.

#### ***Basic decoding skills assessment***

The Bryant Test is made up of fifty pseudowords that cover the simple and complex code and polysyllabic level decoding of the alphabetic code. The first twenty words were CVC (consonant-vowel-consonant) words representing the simple code with the next twenty items more complex single syllable pseudowords representing the complex code with the final ten words being polysyllabic words. The Bryant test has a high reliability factor with Juel et al. (1986) [25] reporting reliabilities between 0.90 and 0.96 and Tse and Nicholson (2014) [26] reporting a positive test-retest correlation ( $r=0.72$ ,  $N=96$ ). The test has a clear sequence of difficulty [26] to polysyllabic level [27] and although devised in 1975, the test continues to be utilised as an assessment of basic decoding skills [28,26].

#### ***Automatic word recognition assessment***

The Appellation State Word Recognition Inventory (ASUWRI) test assesses automatic word recognition by requiring pupils to read 10 individual words that appear on a computer screen. Each word is presented for one second before the next word appears. The pupil attempts to read the word with correct or incorrect identification logged. One second of presentation is considered optimum for assessment purposes [29]. Three separate tests of ten words were undertaken by each pupil and a mean score recorded. The test has an accuracy rate of 96% [30] and has been established as one of the foremost automaticity assessments [30,31]. Previous research has established that scores from isolated word recognition assessments, and ASUWRI specifically, closely align with overall reading competency [32]. The ASUWRI assessment is age-specific so the tests completed by the children when in year six were different to those completed in year five. As the assessments originated in the United States, American spellings were changed to English spellings and contextually specific words excluded (e.g., 'coyote').

#### ***Reading fluency assessment***

Fluency was measured utilising the Dynamic Indicator of Basic Early Language Skills – DIBELS [33]. A words-read-per-minute score was recorded along with an accuracy score. DIBELS has been widely used to monitor progress in fluency and has an accuracy rate of 90% [34] and its high levels of reliability and validity has been recognised in a number of studies [35,36,37]. As the assessments originated in the United States, contextually specific texts were excluded, and American spellings were changed to English spellings.

#### ***Reading comprehension assessment***

The Progress in Reading Assessment (PiRA) produced by Hodder and Stoughton [38] is a standardised reading comprehension test that produces a raw score that can be converted into a standardised score. The standardised expected score is produced by the mean score from a sample of 15,000 pupils [38] representing a score of 100. Analysis by the producers of the test indicated that the standardised score of 100 equates to the national expected standard with an accuracy level of 92% [38]. The tests were already utilised by all four schools so pupils had experience of the format and test protocols.

#### ***KS2 National Curriculum Assessments***

As the pupils in the sample were completing year six studies in the final year of the research study, they were required to sit end of KS2 National Curriculum tests. These included a reading comprehension paper the results of which were included in the research. The KS2 National Curriculum reading assessments produced a raw score (out of 50) and a standardised score with 100 being the nationally 'expected standard' with scores in excess of 109 indicating a 'higher standard'.

#### ***Mean scores***

The assessments produced scaled numerical data. The pre-test mean scores for the intervention group and the comparison group were compared and it was ascertained whether a significant statistical difference between the pre-test means existed. The post-test mean scores for the intervention group and the comparison group were then compared and the difference in means analysed for significance. Any improvements in mean scores from pre-test and post-test assessments for both the intervention group and the comparison group were compared. These data were subjected to statistical testing to ascertain the significance or otherwise of any improvement or deterioration in scores.

#### ***The Phonics Programme***

The selected programme was 'SoundsWrite'; a DfE (2019) [39] approved Systematic Synthetic Phonics programme. The programme is divided into the simple code, the complex code and polysyllabic decoding with five different generic lessons for each. The programme cited a number of positive case studies from schools but also had its own research base [40], following 1607 pupils across 24 state primary schools over 6 years. The study used a standardised spelling age test rather than word reading or comprehension test justifying this as a more accurate indication of decoding. Their research indicated that all pupils in the study made improvements compared to the pupils on whom the test was originally standardised. This study found little or no variations across gender, socio-economic or geographical groupings.

As pupils in the sample had exhibited comprehensive basic decoding skills of the simple phonic code, the instruction commenced with the programme's teaching of the complex code and polysyllabic level. All pupils in the intervention group received phonics instruction three times a week from autumn 2017 to autumn 2018 from their class teachers who received training in delivering the intervention. For temporal efficiency

the programme was structured to ensure coverage of all complex and polysyllabic elements within the time allocated within the timetable. Lessons focused on either decoding or encoding with an emphasis on the polysyllabic level. Each lesson lasted 30 minutes and was timetabled on Mondays, Wednesdays and Fridays. There were 50 units in the programme that covered the complex code including polysyllabic level decoding and encoding. The lessons were cumulative, taught in order with no lesson omitted. There were 120 lessons in total that were timetabled across seven terms. All teachers delivering the programme received the full four days of 'SoundWrite' training and successfully completed the required end of training assessment.

## Results

### *Distribution of data*

A Kolmogorov-Smirnov test indicated in all cases a significance value was less than .05 indicating a significant deviation from normality. Non-parametric tests were therefore used to analyse the data. IBM@SPSS® statistical software platform was used exclusively for all statistical analysis.

### *Decoding assessment – Bryant test*

A Wilcoxon signed ranks test was carried out on the 2017 and 2018 scores which showed that for the intervention group, the mean score had increased significantly from 2017 ( $M=38$ ) to 2018 ( $M=45$ ),  $T=703$ ,  $Z=-5.3$ ,  $p<.001$ ,  $r=.60$ . For the comparison group, the mean score had also increased significantly, from 2017 ( $M=38$ ) to 2018 ( $M=42$ ),  $T=378$ ,  $Z=-4.5$ ,  $p<.001$ ,  $r=.54$ . The significant increase in the mean score for the comparison group suggests that pupils improve decoding without specific phonics instruction. However, in autumn 2018, a Mann-Whitney test revealed that the mean score of the intervention group ( $M=46$ ) was significantly greater than that of the comparison group  $U=1535.0$ , ( $M=42$ )  $p<.01$ ,  $r=.14$ , suggesting that the phonics intervention had had a more positive effect on basic decoding skills in comparison to no specific instruction.

By autumn 2018, 54% of the pupils in the intervention group scored full marks on the Bryant assessment compared to 9% of pupils in the comparison group.

### *Word recognition assessment -ASUWRI test*

A Wilcoxon signed ranks test was carried out on the 2017 and 2018 scores which showed that for the intervention group, the mean score had increased significantly from 2017 ( $M=7.1$ ) to 2018 ( $M=8.6$ ),  $T=71891$ ,  $Z=-6.9$ ,  $p<.001$ ,  $r=.53$ . For the comparison group, the mean score had increased significantly from 2017 ( $M=6.8$ ) to 2018 ( $M=7.6$ ),  $T=300$ ,  $Z=-4.6$ ,  $p<.001$ ,  $r=.51$ . The significant increase in the mean score for the comparison group suggests that pupils improved word recognition without specific phonics instruction. However, a Mann-Whitney test revealed that in autumn 2018, the mean score of the intervention group ( $M=8.6$ ) was significantly greater than that of the comparison group  $U=1549.0$ , ( $M=7.6$ )  $p<.01$ ,  $r=.1$ , suggesting that the phonics instruction had had a positive effect on word recognition in comparison to no instruction.

### *Reading fluency assessment – DIBELS words-read-per-minute*

A Wilcoxon signed ranks test was carried out on the 2017 and 2018 scores which showed that for the intervention group the mean score had increased significantly from 2017 ( $M=104$ ) to 2018 ( $M=130$ ),  $T=230$ ,  $Z=-7.31$ ,  $p<.001$ ,  $r=.57$ . For the comparison group, the mean score had increased significantly from 2017 ( $M=104$ ) to 2018 ( $M=112$ ),  $T=573$ ,  $Z=-4.7$ ,  $p<.001$ ,  $r=.54$ . This suggests that pupils who did not receive the phonics intervention were still able to make significant improvements in reading rates. A Mann-Whitney test revealed that in autumn 2017 there was no significant difference between the mean score of the intervention group ( $M=104$ ) and that of the comparison group ( $M=104$ )  $p>.05$ ,  $U=1491.0$ . However, in autumn 2018, the mean score of the intervention group ( $M=130$ ) was significantly greater than that of the comparison group ( $M=112$ )  $p<.01$ ,  $U=967.0$ .

### *Reading fluency assessment – DIBELS % of words read accurately*

Increases in the reading accuracy mean scores were modest and differences between the intervention group and the comparison group not significant across the sample.

### *Reading fluency combined assessment*

Pupils who had a combination of a words per minute score greater than 100 and an accuracy rate of 98% or greater were assessed as reading fluently [41,34,42]. Using this criterion, for the intervention group, pupils assessed as reading fluently rose from 36% in 2017 to 71% in 2018. For the comparison group, pupils assessed as reading fluently rose from 32% in 2017 to 50% in 2018.

A chi-square test was performed to ascertain whether there was a link between pupils assessed as reading fluently and whether they were part of the intervention group or the comparison group. For the 2017 benchmark data there was not a significant relationship between the variables,  $X^2(1, N=125) = .17$ ,  $p>.05$ . For the 2018 data there was a significant relationship between the variables,  $X^2(1, N=125) = 4.0$ ,  $p<.05$ , suggesting that after the phonics programme, a significantly greater number of pupils in the intervention group read fluently compared to pupils in the comparison group.

### *Reading comprehension assessment – PiRA test*

A Wilcoxon signed ranks test was carried out on the 2017 and 2018 scores which showed that for the intervention group the mean score had increased significantly from 2017 ( $M=93$ ) to 2018 ( $M=105$ ),  $T=3817$ ,  $Z=-7.7$ ,  $p<.001$ ,  $r=.60$ . A Wilcoxon signed ranks test was carried out on the 2017 and 2018 scores which also showed that for the comparison group the mean score had increased significantly from 2017 ( $M=94$ ) to 2018 ( $M=98$ ),  $T545$ ,  $Z=-4.7$ ,  $p<.001$ ,  $r=.57$ . This suggests that although the mean score for the intervention group increased more than for the comparison group, pupils who did not receive the phonics intervention were still able to make significant improvements in reading comprehension.

A Mann-Whitney test revealed that in autumn 2018, the mean score of the intervention group ( $M=105$ ) was significantly greater than that of the comparison group ( $M=98$ ),  $U=901.0$ ,  $p<.01$ , suggesting that pupils who had received the phonics instruction had made greater progress in reading comprehension in comparison to pupils who received no instruction. Of the 53 pupils across the whole sample who scored full marks on the Bryant test, all achieved a standardised score in excess of 100 and had a mean score of 110.

Of the 53 pupils across the whole sample who scored full marks on the Bryant test, all achieved a standardised score in excess of 100 and had a mean score of 110; 53% achieved the higher standard of reading comprehension. All pupils who achieved the higher standard scored 49 or 50 on the Bryant test in autumn 2018. These data imply that readers who have comprehensive knowledge of basic decoding skills appear to have a greater likelihood of achieving the expected standard of reading comprehension.

#### **Reading comprehension assessment – KS2 National Curriculum Tests reading paper.**

All 125 pupils in the sample sat the 2019 National Curriculum Reading assessment.

For the 2019 KS2 National Curriculum reading assessment, a Mann-Whitney test revealed that the mean score of the intervention group ( $M=105$ ) was significantly greater than that of the comparison group ( $M=99$ )  $p=.001<.05$ ,  $U=941.0$ .

In the intervention group, 83% of pupils achieved the expected standard in the KS2 National Curriculum reading assessment 2019, ten percentage points above the national average for England [39], with 30% achieving the higher standard, three percentage points above the national average [39]. The two schools' (from which the intervention group was drawn) combined KS2 National Curriculum reading outcomes for 2017 were 61% at expected standard (2017 national average for England =72%) and 61% at expected standard for 2018 (2018 national average for England = 75%). Although any direct comparison is conflated by different cohorts and contextual influences that may have included longer exposure to more efficacious teaching, there was an improvement in reading outcomes in 2019.

In the comparison group, 56% of pupils achieved the expected standard in the National Curriculum KS2 reading paper 2019, 17 percentage points below the national average for England [39], with 12% achieving the higher standard, 15 percentage points below the national average [39]. The two schools' (from which the comparison group was drawn) combined KS2 National Curriculum reading outcomes for 2017 were 53% (2017 national average for England = 72%) and 64% for 2018 (2018 national average for England = 75%). Although any direct comparison is conflated by different cohorts and contextual influences, there was not an improvement in reading outcomes in 2019.

The 95 pupils across the whole sample who achieved the expected standard in the 2019 KS2 National Curriculum Tests reading paper had a mean score on the Bryant assessment of 48 (out of 50). Ninety of the 95 pupils scored full marks on the simple and complex code elements of the Bryant assessment (40 out of 40) with the remaining five scoring in excess of 36 marks. These data support the suggestion that substantial code knowledge supports effective reading comprehension although comprehensive knowledge of basic decoding skills does not appear to be essential.

The 53 pupils who scored full marks on the Bryant test in autumn 2018 had a mean score of 108 with all of the 53 pupils achieving the 'expected standard' in reading. This suggests that pupils who have mastered basic decoding skills have a greater likelihood of comprehending text well.

#### **Correlation analysis – Bryant Test of Basic Decoding Skills**

Correlations between the Bryant test and all other reading assessments were significant suggesting a strong positive relationship between the ability to decode and reading fluency and the ability to decode and reading comprehension. The positive correlations between scores on the Bryant test and scores on the ASUWRI test,  $r_s=.828$ ,  $p<.001$ (1-tailed) indicated that the relationship between decoding and word reading is strong and positive. The relationship between scores on the test and words read per minute on the DIBELS reading fluency assessment,  $r_s=.742$ ,  $p<.001$ (1-tailed) was also strong, suggesting that greater phonics knowledge promotes faster reading rates. This indication that phonics knowledge promotes reading fluency was further supported by the positive correlation between scores on the test and the accuracy % score on the DIBELS reading fluency assessment,  $r_s=.798$ ,  $p<.001$ (1-tailed).

#### **Correlation analysis – ASUWRI assessment**

There was a strong positive correlation between scores on the ASUWRI test and words read per minute on the DIBELS assessment,  $r_s=.787$   $p<.001$ (1-tailed) indicating that automatic word recognition is strongly related to reading rate. There was also a strong positive correlation between scores on the ASUWRI test and scores on the accuracy assessment  $r_s=.809$   $p<.001$ (1-tailed). A strong positive correlation was also recorded between word recognition and the National Curriculum KS2 reading assessment,  $r_s=.621$ ,  $p<.001$ (1-tailed).

#### **Discussion**

The significant improvements in the mean basic decoding skill scores in the comparison group suggested that pupils in upper KS2 who have deficit in these skills can improve their phonic knowledge as part of regular reading instruction and without routine phonics teaching. However, the significant differences between the comparison group and the intervention group in Bryant test outcomes indicate that systematic phonics instruction in KS2 has a positive impact on code knowledge where there is a deficit. That pupils scoring full marks on the pseudoword test rose from 0% to 55% for the intervention group but from 0% to 9% in the comparison group suggests that the phonics instruction was more effective in improving code knowledge than no instruction.

Moreover, pupils in the intervention group recorded improvements significantly beyond those of the comparison group in word recognition, reading fluency and reading comprehension (although not in reading accuracy). The intervention group also recorded significantly higher KS2 National Curriculum Test reading outcomes. It can therefore be posited that the improvements in reading fluency and reading comprehension may have been associated with improved code knowledge.

The suggestion that, where a code deficit exists, the mastering of the complexities of the English alphabetic code for older children is often too complex an undertaking and that a different approach is required [4,5,43] is not supported by the data. The results suggest that pupils in upper KS2 are able to significantly improve their basic decoding skills with regular, specific phonics instruction. The significant improvements in word reading imply that compensatory word attack strategies can be replaced with phonic strategies once code knowledge improves with the resultant improvements in orthographic processing.

Furthermore, the data suggested that although comprehensive expertise of decoding to polysyllabic level is not a requirement for reading fluency to become manifest, substantial code knowledge of the simple and complex code is. All 77 pupils assessed as reading fluently in autumn 2018 had scores on the Bryant test that indicated substantial code knowledge (scores in excess of 38 marks) and comprehensive knowledge of the simple and complex code. This triangulated with the autumn 2017 data where, of the 44 pupils assessed as reading fluently, all exhibited substantial knowledge of the simple and complex codes on the Bryant pseudoword test (scores in excess of 38 marks). This implies that comprehensive knowledge of the English phonic code including polysyllabic level decoding is not necessary for reading fluency to develop, however, substantial knowledge of the complex code is likely to be a requirement. This lack of threshold clarity emerged again with the word recognition assessment (ASUWRI) results. Of the sixty-three pupils to score full marks on the ASUWRI assessment in autumn 2018, 46 scored full marks on the Bryant Test of Basic Decoding Skills (1975) [44]. This seemingly undermines the suggestion that comprehensive decoding ability is a requirement for advanced word reading. However, for the 63 pupils who scored full marks on the ASUWRI word recognition test, 62 scored full marks on the simple and complex code elements (the first 40 pseudowords correctly decoded) with at least four polysyllabic pseudowords decoded correctly. For the 53 pupils who scored full marks on the Bryant Test of Basic Decoding Skills, forty-six scored full marks on the ASUWRI test with the other seven scoring eight or nine marks (out of 10). The conclusion supported by the data is that developing phonic code knowledge enhances the development of orthographic processing.

That developing phonic code knowledge enhances rapid word recognition is supported by the positive correlation between the pseudoword test [44] scores and the word recognition scores. The positive correlation between word recognition scores and KS2 National Curriculum Test reading scores further supports the importance of orthographic processing development for

reading fluency and comprehension. The importance of code knowledge and orthographic processing for the development of reading fluency is further indicated by analysis of the forty-six pupils in the sample who scored full marks on both the Bryant test and the ASUWRI test. These pupils were all assessed as reading fluently with reading rates in excess of 122 wpm and with a mean rate of 152 wpm and all achieved the 'expected standard' in the PiRA assessment and at KS2 National Curriculum reading assessment with twenty-one of these pupils achieving the 'higher standard'. These data suggest that competent readers in their seventh year of primary schooling, who are able to extract significant meaning from multiple texts, have developed the ability to recognise words automatically. This indicates that orthographic processing has developed to an advanced state and that the majority of words are being identified instantly and no longer through serial phoneme by phoneme decoding and blending. This adds weight to the assertion that systematic phonics instruction, even in later years, through its efficiency at improving code knowledge, is an effective strategy for developing word recognition and thereby promoting reading fluency. This is further supported by the positive correlation between pseudoword test scores, word recognition scores and the DIBELS words-per-minute scores which suggest that systematic decoding instruction which improves code knowledge also supports reading speeds.

All 53 pupils who scored full marks on the Bryant (1975) [44] test achieved the 'expected standard' in the National Curriculum KS2 reading paper with a mean score of 108 (and a mean PiRA score of 110 in autumn 2018). This, with the strong, positive correlation between Bryant (1975) [44] test scores and PiRA scores and National Curriculum KS2 reading paper outcomes, implies that comprehensive knowledge of the phonic code is strongly related to effective reading comprehension in line with 'The Simple View of Reading' [6]. Comprehensive mastery of basic decoding skills according to this study's results is not a precondition for effective comprehension, but the data imply that pupils who read fluently and comprehend well have substantial code knowledge.

### **Limitations**

Although a comparison group was utilised for the study, the selection of pupils across the sample was not randomised. This was the result of the necessity of utilising a convenience sample. As such, the comparison group contained fewer pupils than the intervention group and the two groups were made up of pupils from different schools taught in different settings by different teachers. This resulted in a number of variables, that could not be controlled and that may have influenced and affected outcomes. Teacher efficacy, experience and subject knowledge along with school culture and environment accompanied by pupil opportunities and parental engagement will all have influenced outcomes. The variable of teacher quality should not be underestimated [45].

A further limitation of the study was the restricted construction of the sample and its lack of social, economic, ethnic and academic diversity. All schools were located in areas of high social deprivation with a significant percentage of pupils for

whom English was not a first language. It is, therefore, difficult to extrapolate findings to contexts with children with higher socioeconomic status where pupils have greater access to texts and where parental engagement, academic capital and agency may be more pronounced. Although a limitation of the study in terms of wider inferences from the data, the restricted demographic may also be perceived as a strength. The improvements recorded within the less affluent social and economic context of the study may still have relevance for these contexts where reading outcomes are historically lower [46].

**Data availability:** Data from the study will be made available.

**Ethics:** This study was approved by the Ethics Committee of St. Mary's University, Twickenham, London.

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