

## Decoding the phonics screening check

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The statutory ‘phonics screening check’ was introduced in 2012 and reflects the current emphasis in England on teaching early reading through systematic synthetic phonics. The check is intended to assess children’s phonic abilities and their knowledge of 85 grapheme–phoneme correspondences (GPCs) through decoding 20 real words and 20 pseudo words. Since the national rollout, little attention has been devoted to the content of the checks. The current paper, therefore, reviews the first three years of the check between 2012 and 2014 to examine how the 85 specified GPCs have been assessed and whether children are only using decoding skills to read the words. The analysis found that out of the 85 GPCs considered testable by the check, just 15 GPCs accounted for 67% of all GPC occurrences, with 27 of the 85 specified GPCs (31.8%) not appearing at all. Where a grapheme represented more than one phoneme, the most frequently occurring pronunciation was assessed in 72.2% of cases, with vocabulary knowledge being required to determine the correct pronunciation within real words where multiple pronunciations were possible. The GPCs assessed, therefore, do not reflect the full range of GPCs that it is expected will be taught within a systematic synthetic phonics approach. Furthermore, children’s ability to decode real words is dependent on their vocabulary knowledge, not just their phonic skills. These results question the purpose and validity of the phonics screening check and the role of synthetic phonics for teaching early reading.

**Keywords:** phonics; grapheme–phoneme correspondences; reading; decoding

### Introduction

In England, the current emphasis in teaching children to read is through a systematic synthetic phonics approach (DfE, 2010a, 2013a). This approach reflects the ‘simple view of reading’ (Gough & Tunmer, 1986; Hoover & Gough, 1990) and suggests that teaching early reading should focus on phonic decoding; converting graphemes into phonemes and blending these phonemes to form recognisable words (Ehri, 2003). A statutory ‘phonics screening check’ (PSC) has now been introduced to ‘*encourage schools to pursue a rigorous phonics programme*’ with the hope that specifically ‘*promoting systematic synthetic phonics*’ will result in an ‘*increase in the number of children able to read*’ by the end of Key Stages 1 and 2 (DfE, 2012a, p. 5). Rather than a test of reading in the fullest sense (i.e. where meaning also counts), the PSC tests whether pupils’ phonic decoding skills have reached an age-appropriate level by the end of Year 1 (DfE, 2010a). Coinciding with the end of the review period for the PSC (see Walker *et al.*, 2015), this paper examines the content of the ‘check’ between 2012 and 2014 and whether it reflects the assumptions of a systematic synthetic phonics approach to teaching early reading.

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Systematic phonics instruction refers to teaching reading through the acquisition of grapheme–phoneme correspondences (GPCs) in a clearly defined incremental sequence (Togerson *et al.*, 2006). *Synthetic phonics* is a way of teaching systematic phonics where pupils are taught (i) individual GPCs and (ii) how to blend them together to give the correct pronunciation of a word (Wyse & Goswami, 2010). Whilst the term ‘synthetic phonics’ refers to how children are taught to identify and blend GPCs, it does not prescribe which GPCs should be taught. Systematic synthetic phonics *programmes* can therefore vary in relation to their content and the rationale for which GPCs to teach (Carnine *et al.*, 2009). Following the findings of the Rose Report (Rose, 2006) and the Ofsted report ‘Reading by Six’ (Ofsted, 2010), the Schools White Paper (DfE, 2010a) stated, ‘*the teaching of systematic synthetic phonics is the most effective way of teaching young children to read*’ (p. 43). A phonics catalogue was introduced in 2011, which contained details of phonics programmes that were defined by the DfE as meeting the ‘*key features of an effective systematic synthetic phonic programme*’ (DfE, 2010b, p. 1). In the current paper, unless otherwise stated, references to systematic synthetic phonics programmes therefore refer to the government interpretation and approach to teaching synthetic phonics.

### *Introduction of the PSC*

To encourage schools to adopt the approved systematic synthetic phonics schemes, matched funding of up to £3000 was made available to schools that chose a programme from the catalogue (DfE, 2011a). Similarly, knowledge of systematic synthetic phonics became a key component of the Teachers’ Standards, stating that ‘*if teaching early reading*’, primary teachers and trainees ‘*must demonstrate a clear understanding of systematic synthetic phonics*’ (DfE, 2011b, p. 11). Teaching systematic synthetic phonics (DfE, 2011b) now forms a key part of the statutory requirements of the National Curriculum (DfE, 2013a), requiring children to ‘*apply phonic knowledge and skills as the route to decode words*’ and ‘*respond speedily with the correct sound to graphemes (letters or groups of letters) for all 40+ phonemes, including where applicable, alternative sounds for graphemes*’ (DfE, 2013a, p. 20). This emphasis on children’s phonic abilities culminated in the introduction of the PSC, a statutory assessment focusing ‘*solely on using phonics*’ (DfE, 2012a, p. 5) to ensure children’s skills are ‘*on track*’ (DfE, 2010a, p. 43).

### *Content of the PSC*

Developed by four phonics experts,<sup>1</sup> the purpose of the PSC is to ‘*encourage schools to pursue a rigorous phonics programme*’ (DfE, 2012b, p. 5) by assessing whether children’s decoding skills have reached an age-appropriate level after two years of full-time education. The PSC aims to ‘*identify children who have not learned to decode using phonics by the end of Year 1*’ (DfE, 2012b, p. 5), with any students not meeting the appropriate standard receiving extra support to improve their phonic decoding skills (DfE, 2012a,b). The 20 pseudo words and 20 real words used in the PSC are intended to be unfamiliar and presented without context, so that children can only use a ‘*phonic decoding*’ strategy to read the words correctly. The use of pseudo words

is seen as the ‘*purest assessment of phonic decoding*’, since children cannot use other strategies—such as vocabulary knowledge or visual word memory—to decode the words (DfE, 2012b, p. 8). Similarly, 40%–60% of the real words used in each check represent ‘*less common*’ words, to reduce the chances that children are relying ‘*on sight memory of words they have seen before*’ (DfE, 2012b, p. 8). The PSC specifically aims to promote ‘*the teaching of systematic synthetic phonics*’ (DfE, 2012b, p. 5), with the results of the PSC informing Ofsted judgements on the early teaching of reading, as well as being made available both in the local authority and nationally to ‘*allow schools to benchmark the performance of their children*’ (DfE, 2012a, p. 5). The real words and pseudo words presented in the PSC, therefore, only comprise GPCs taught through the five government-approved programmes that met the core criteria for ‘*an effective systematic synthetic phonics teaching programme*’ at the time of the 2011 pilot study (DfE, 2012a, p. 12; see also DfE, 2010b).<sup>2</sup> As included in these programmes, this includes graphemes that represent multiple phonemes (e.g. the digraph ‘ou’ could appear in the check as ‘soup’, ‘out’, ‘could’ or ‘soul’).

### Criticisms

Since the national rollout, the PSC has drawn significant opposition from teachers (e.g. Davis, 2012; HTU, 2012; NUT, 2012, 2013; NAHT, 2013a,b). Interim reports conducted by the National Foundation of Educational Research (NFER) demonstrate that the majority of teachers describe the check as unnecessary, considering it as providing no new valuable information about their pupils’ reading abilities and suggesting it will make minimal impact on the standards of reading in schools (Walker *et al.*, 2013, 2014, 2015). In addition, the worth and content of the check has been criticised (NAHT, 2012), with concerns over the inclusion of pseudo words as well as the lack of emphasis on comprehension (Davis, 2013; see also Walker *et al.*, 2013, 2014).

These criticisms exist alongside wider concerns over the promotion of systematic synthetic phonics as the prime approach to teaching early reading (Wyse & Styles, 2007; Wyse & Goswami, 2010; Ellis & Moss, 2014). These concerns have raised questions about the validity and value of the check, with reservations expressed about its content and whether it assesses what it claims to measure (Davis, 2012; Clark, 2013). Firstly as suggested by Davis (2013), given that the aim of the PSC is only to assess children’s decoding skills success or failure on the task must only be dependent on children’s ability to decode phonically, which means that they should not be required to use any additional skills to pass the check. Equating decoding with early reading has particular implications for decoding the real words within the check, as children should not be required to draw on meaning to help them identify the correct pronunciation of a word. Opponents of the check suggest that this approach simplifies the complex link between decoding and meaning (Davis, 2012, 2013) and ignores the importance of vocabulary knowledge when decoding (e.g. Nation & Snowling, 1998; Tunmer & Chapman, 2011, 2012; Cain *et al.*, 2015), particularly when reading unfamiliar words with irregular spellings (e.g. Venezky, 1999; Perfetti, 2007).

Secondly, whilst the process of learning to read involves a combination of skills (e.g. knowledge of whole words and onset and bodies; see Vousden, 2008), a

synthetic phonics approach focuses solely on first mastering the relationships between letters and sounds (Togerson *et al.*, 2006). As set out in the Rose Report (Rose, 2006), a systematic synthetic phonics approach to teaching early reading should focus on the ability to decode, with this shifting to comprehension only when children have mastered the alphabetic code. As defined by the DfE (2010a), the ‘*core criteria for a high quality phonics programme*’ covers ‘*all major grapheme/phoneme correspondences*’ and ‘*demonstrates that phonemes should be blended, all through the words for reading*’ (p. 2). To be an accurate assessment of this knowledge, the PSC should aim to reflect the range of GPCs taught by government-approved synthetic phonics programmes.

This has particular relevance in relation to the frequency of occurrence of the GPCs tested, specifically concerning the testing of multiple mappings. The English language has a deep orthography, with the correspondences between spelling and sound being non-transparent (Goswami *et al.*, 2005). More specifically, a single grapheme can represent multiple phonemes (e.g. ‘a’ in ‘rat’ and ‘father’) and a phoneme can be represented by multiple graphemes (e.g. /s/ in ‘face’ and ‘sat’). Although the English language is considered highly irregular (Goswami *et al.*, 2005), a large proportion of the words used within the English language contain regular spelling-to-sound correspondences (Hanna *et al.*, 1966; Berndt *et al.*, 1987, 1994). For example, the digraph ‘ch’ is associated with four different phonemes yet it is most frequently pronounced as in ‘**ch**eck’ (Gontijo *et al.*, 2003). As demonstrated by Vousden (2008), when taking the most frequent mapping of a grapheme into consideration, just 50 of the most frequent GPCs account for nearly half the word tokens (47.7%) in monosyllabic text. In other words, a small proportion of high-frequency GPCs account for a large proportion of written text (Vousden, 2008; see also Solity & Vousden, 2009). In relation to the content of the PSC, the assessment framework states that the ‘*inclusion of a particular grapheme will not necessarily be in proportion to its frequency in words*’. For example, ‘*the letter “t” will not necessarily appear more frequently than the letter “x” even though it is more common*’ (DfE, 2012b, p. 8). Indeed, the assessment framework states that ‘*over time, the phonics screening check will include all single letters of the alphabet and all grapheme–phoneme correspondences listed in this document*’ (DfE, 2012b, p. 8). Rather than reflecting the frequency of occurrence found in written English, the PSC therefore aims to give a more equal weighting to GPC occurrences. As such, the content of each individual PSC should include both high and low-frequency GPCs, including less frequent pronunciations of graphemes. In addition, over the years of the PSC, all specified GPCs should appear within the content of the checks.

### *Focus of the current study*

The intended impact of the PSC is therefore to ensure that children’s phonic and decoding skills are ‘*on track*’ (p. 43) and to confirm that schools are effectively delivering a government-approved systematic synthetic phonics approach (DfE, 2010a). Here we examine the content of the first three years of the PSC (2012–2014) to explore whether the skills tested by the checks reflect the intended impact of the PSC. First, given that the PSC aims to identify children’s ability to decode, we explore whether the content of the check ensures children

are only using phonic decoding skills to read the words. Second, as the PSC was introduced within the context of ‘*promoting systematic synthetic phonics*’ (DfE, 2012b, p. 5), we explore how well the GPCs assessed reflect those taught in the government-approved systematic synthetic phonics approaches. Eighty-five GPCs were deemed suitable to appear in the PSC as they appeared in at least two out of the five systematic synthetic phonics programmes, which met the core criteria of a systematic synthetic phonics approach defined by the DfE (see DfE, 2010b, 2011a, 2012a). We therefore assess the frequency of occurrence of these 85 GPCs to examine both the number and type of GPCs that have been assessed.

## Method

### Materials

The GPCs that *could* appear in the ‘check’ were specified in the ‘assessment framework for the development of the Year 1 phonics screening check’ (DfE, 2012b, pp. 9–14). Eighty-five GPCs were identified, representing 64 graphemes and 44 phonemes<sup>3</sup> (see Table S1 in the supplementary material for a list of the 85 GPCs). The 64 graphemes consist of 25 single-letter graphemes (e.g. ‘a’), 32 digraphs (e.g. ‘th’), 5 split digraphs (e.g. ‘o-e’) and 2 trigraphs (e.g. ‘air’). Out of the 64 graphemes, 18 (28.12%) have a specified multiple mapping (i.e. the grapheme represents more than one associated phoneme which can be tested). It is important to note that not all the possible phonemes represented by a grapheme were tested by the check. For example, whilst the grapheme ‘y’ has multiple mappings within the English language (e.g. in ‘mysterious’, ‘try’, ‘yard’; see Gontijo *et al.*, 2003), only one pronunciation is tested within the check (as ‘yard’). In relation to the check, ‘y’ would not be considered a grapheme with a multiple mapping as it only has one specified pronunciation (see Table 1 for the total number of graphemes and associated number of GPCs that can appear in the check).

Table 1. Summary of graphemes and GPCs that can be including in the phonics screening check

Type of grapheme	Number of phonemes the grapheme represents (i.e. the number of specified mappings)	Total number of graphemes	Total number of associated GPCs
Single letter (i.e. ‘a’)	1	17	17
	2	8	16
Digraph (i.e. 2 letters, ‘th’ or ‘u-e’)	1	27	27
	2	8	16
	3	1	3
	4	1	4
Trigraph (i.e. 3 letters, ‘air’)	1	2	2
	<b>Total</b>	<b>64</b>	<b>85</b>

### Procedure

Each PSC consists of 40 words (20 real words and 20 pseudo words), with a different set of words being tested each year. The three checks administered between 2012 and 2014 have assessed pupils' decoding skills on 120 words. In order to assess which of the 85 GPCs have been tested over these three years, a database was created containing the phonemic representation of each of the 120 words (see Tables S2 and S3 in the supplementary material for the phonological representations of the pseudo words and real words). Using these representations, the GPCs in each word were identified, creating a frequency of occurrence for each of the 85 specified GPCs. For the real words, the phonemic representations were taken from the Children's Printed Word Database (CPWD) (Stuart *et al.*, 1996), resulting in one correct phonemic representation for each word. In contrast, the pseudo words have multiple *plausible* pronunciations and so, as a consequence, multiple possible phonemic representations. It is important to note that it is stated within the scoring guidance for the PSC that '*alternative pronunciations of graphemes will be allowed in pseudo words*' (e.g. DfE, 2014a, p. 14), but children only have to give *one* plausible pronunciation to be scored correct. Thus, in order to gauge the GPCs most likely to have been tested by the pseudo words, the phonemic representation selected was based on the most likely pronunciation of the pseudo word given the orthographic structure.<sup>4</sup>

Selection of the most likely pronunciation was based on the example phonemic representations and rhyming words provided in the 'scoring guidance' (DfE, 2012c, 2013b, 2014a) and checked against the probability of occurrence calculated by Gontijo *et al.* (2003). For example, the pseudo word 'pib' reflects four *possible* GPCs: /p/ as 'pig' and /b/ as 'bat' with the grapheme 'i' associated with two specified multiple mappings (as in 'hit' or 'mind') (DfE, 2012b). Given any '*alternative pronunciations of graphemes will be allowed in pseudo words*' (DfE, 2014a, p. 14), the phonemic representations for 'pib' could therefore be 'p/I/b' or 'p/aI/b', with either pronunciation being accepted as correct within the PSC. In the scoring guidance, however, the most likely pronunciation of the pseudo word is specified as 'p/I/b' stating '*this item uses the /p/ from pig and rhymes with nib*' (DfE, 2012c, p. 2). This pronunciation corresponds with the probability of occurrence specified by Gontijo *et al.* (2003), with the grapheme 'i' being more frequently pronounced as in 'hit' than 'mind' [see Table S4 in the supplementary material for a summary of the Gontijo *et al.* (2003) probabilities associated with each GPC]. Within the analyses, the phonemic representation for 'pib' was therefore specified as 'p/I/b'.

It is worth noting that out of the 60 pseudo words, there were only four exceptions (6.66%) where the most likely pronunciation of the specified multiple mapping (as stated in the scoring guidance; DfE, 2012c, 2013b, 2014a) favoured the less frequent pronunciation of a grapheme when checked against the probabilities calculated by Gontijo *et al.* (2003). For the pseudo words 'yune', 'thrand', 'poth' and 'proom', the example word given in the guidance ('June', 'throw', 'moth' and 'broom', respectively) reflected the less frequent pronunciation of the graphemes 'u-e' (as in 'u:') 'th' (as in 'T') and 'oo' (as in 'u:'). In all other instances, the orthographic structure of the pseudo words favoured the most frequent pronunciation of a grapheme where a multiple mapping was specified.

## Results

### *Number of GPCs assessed*

The following sections examine the number and range of GPCs (single letter, digraphs and trigraphs) assessed by the PSC between 2012 and 2014.

*How many of the specified GPCs have been tested?* The phonemic representations of the 120 words were identified to give the total number of GPCs tested over the three years (see Table S5 in the supplementary material for the frequency of occurrence of the GPCs tested). This gave a total of 460 GPCs tested, with these GPCs reflecting 58 (i.e. 68.24%) out of the 85 GPCs specified as being testable. These 58 GPCs appeared at least once over the three years and represent 26 out of the 33 specified single-letter GPCs (e.g. ‘a’ as ‘cat’ and ‘e’ as ‘met’) and 32 out of the 52 specified multiple-letter GPCs (e.g. ‘sh’ as ‘ship’ and ‘air’ as ‘chair’). The 26 single-letter GPCs accounted for 78.91% of the total number of GPCs tested (460), with the 32 multiple-letter GPCs accounting for just 20.00%.<sup>5</sup> Thus, although a similar number of different single-letter and multiple-letter GPCs were tested, single-letter GPCs were encountered much more frequently than multiple-letter GPCs (see Table 2 for a breakdown of how many of the 85 GPCs were tested in each year of the phonic screen, as well as the total number of GPCs that appeared within the checks).

*Do some GPCs appear more frequently than others?* Over the three years of the PSC the top five most frequently occurring GPCs were ‘t’ as ‘ten’, ‘s’ as ‘sat’, ‘n’ as ‘bun’, ‘p’ as ‘pat’ and ‘r’ as ‘ran’, with these GPCs accounting for 32.75% of the total number of GPCs tested. Those ranked six-through-ten were ‘l’ as ‘leg’, ‘d’ as ‘dog’, ‘i’ as ‘hit’, ‘m’ as ‘man’ and ‘a’ as ‘at’, with these GPCs accounting for 20.61%. Those ranked 11-through-15 were ‘k’ as ‘king’, ‘c’ as ‘cat’, ‘b’ as ‘ball’, ‘e’ as ‘egg’ and ‘f’ as ‘fun’, with these GPCs accounting for 13.88% (see Table S5 in the supplementary material for the frequencies and rank frequency associated with each GPC). Overall, the 15 most frequently occurring GPCs (17.65% of the 85 GPCs that could have been assessed) accounted for 67.39% of all 460 GPCs tested, with the remaining 43 GPCs that were assessed accounting for only 31.52% of the total GPCs tested.<sup>6</sup> Indeed, as

Table 2. Summary of the number of GPCs tested in each year of the ‘check’

Year	How many GPCs were tested in each check?			How many of the 85 GPCs appeared in each check?			
	Total number of GPCs tested	Single-letter GPCs (%)	Multiple-letter GPCs (%)	Single-letter GPCs	Multiple-letter GPCs	Total	% of specified GPCs tested
2012	152	78.29	21.71	24	23	47	55.29
2013	156	81.41	18.59	22	16	38	44.71
2014	152	80.26	19.74	24	23	47	55.29

shown in Figure 1, the frequency of GPC occurrences decreases with the rank frequency of each GPC. Thus, it appears that a small number of GPCs occur very frequently, with these highly frequent GPCs accounting for a large proportion of the GPCs tested over the three years (see Table 3 for a summary of the 15 most frequent GPCs across each check).

*How many of the specified GPCs have not been assessed?* Overall, there are 27 GPCs (31.76%) that have *not* appeared in any of the three checks. This includes seven single-letter GPCs (e.g. ‘c’ as /s/ in ‘face’) and 20 double-letter GPCs (e.g. ‘au’ as /O:/ in ‘launch’). That means 21.21% of the 33 single-letter GPCs and 40% of the 50 double-letter GPCs that could have been tested by the PSC have not been assessed (see Table 4 for a summary of the difference between what could, and what has, been tested by the PSCs).

*How many unspecified GPCs have been assessed?* As previously stated, the phonemic representations of the real words within the checks were taken from the CPWD (Stuart *et al.*, 1996). Based on these representations, four additional GPCs were found within the real words, which were not specified within the assessment framework as being testable (DfE, 2012b). These additional GPCs appeared at least once over the three years and accounted for 1.09% of the total number of GPCs tested (460). Thus, whilst only 58 out of the 85 specified GPCs were assessed, 62 different GPCs were actually tested, with these four additional GPCs accounting for 6.45% of the 62 GPCs tested (see Table 5 for a list of the additional GPCs tested).

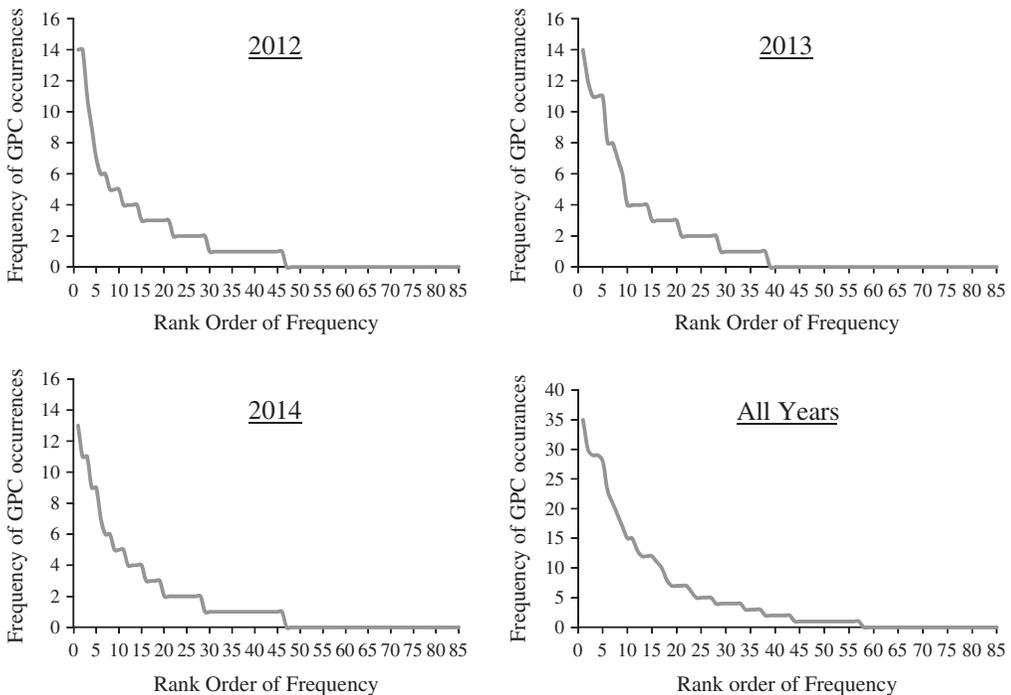


Figure 1. The frequency of GPCs as a function of the rank frequency of each GPC

Table 3. Summary of the 15 most frequent GPCs across each 'phonic screening check'

Rank	2012				2013				2014							
	Grapheme	Phoneme	Frequency	%	Grapheme	Phoneme	Frequency	%	Grapheme	Phoneme	Frequency	%	Grapheme	Phoneme	Frequency	%
1	p	p	14	9.21	s	s	14	8.97	d	d	13	8.55				
2	t	t	14	9.21	t	t	12	7.69	n	n	11	7.24				
3	s	s	12	7.89	l	l	11	7.05	r	r	11	7.24				
4	r	r	9	5.92	n	n	11	7.05	t	t	9	5.92				
5	n	n	7	4.61	p	p	11	7.05	i	l	9	5.92				
6	i	l	6	3.95	k	k	8	5.13	c	k	7	4.61				
7	l	l	6	3.95	r	r	8	5.13	l	l	6	4.61				
8	d	d	5	3.29	a	&	7	4.49	m	m	6	3.95				
9	e	E	5	3.29	m	m	6	3.85	a	&	5	3.29				
10	m	m	5	3.29	o	O	5	3.21	f	f	5	3.29				
11	b	b	4	2.63	b	b	4	2.56	s	s	5	3.29				
12	f	f	4	2.63	c	k	4	2.56	b	b	4	2.63				
13	o	O	4	2.63	e	E	4	2.56	k	k	4	2.63				
14	u	V or U	4	2.63	i	I	4	2.56	u	V or U	4	2.63				
15	a	&	3	1.97	a-e	eI	3	1.92	p	p	3	1.97				
<b>Total</b>				<b>67.11</b>				<b>71.79</b>				<b>67.11</b>				

Table 4. Summary of the difference between what could be tested by the phonics screening checks and what has been tested

2012 to 2014	Items that <i>could</i> appear within the checks	Items that <i>have</i> appeared within the checks	Difference between what could and what has been tested (i.e. the number of items not tested by the checks)
Total number of graphemes	64	55	9
Total number of GPCs	85	58	27
Number of graphemes with a multiple mapping	18	15	3
Number of associated GPCs (i.e. number of multiple mappings)	39	18	21

Table 5. Additional GPCs tested by the phonics screening check

	Real word	Phonemic representation	No. of GPCs in word	Additional GPCs			
				Grapheme	Phoneme	Frequency	% Frequency
2013	<b>fuel</b>	[fjU@l]	4	u	jU	1	0.22
				e	@	1	0.22
	<b>tantrum</b>	[t&n][tr@m]	7	u	@	1	0.22
2014	<b>think</b>	[TINK]	5	n	N	2	0.43
	<b>drink</b>	[drINK]	5				

### *Number of multiple mappings assessed*

This section examines the number of specified multiple mappings assessed by the PSC between 2012 and 2014. As in the previous section, the phonemic representations of the real words reflected those specified in the CPWD (Stuart *et al.*, 1996). Similarly, when pseudo words contained a grapheme with specified multiple mappings, the most likely pronunciation of the word was counted as being assessed (based on the orthographic structure of the word), which corresponded with the most *frequent pronunciation* of the grapheme in all but four cases ('u-e' in 'yune', 'th' in 'thrand' and 'poth' and 'oo' in 'proom').

*How many of the specified multiple mappings have been assessed?* Within the assessment framework there are 39 GPCs containing a grapheme with a specified multiple mapping. Of these 39 GPCs, 18 have been tested over the three years. Thirteen (72.22%) of these 18 GPCs reflect the most frequent pronunciation of the grapheme, with the remaining 5 GPCs reflecting the least frequent pronunciation ('s' in 'hens', 'er' in 'fern', 'th' in 'thin', 'oo' in 'food' and 'u-e' in 'June') (see Table S4 in the supplementary material for the frequencies associated with each specified multiple mapping).

*How many of the specified multiple mappings have not been assessed?* A total of 27 GPCs have not been assessed over the three years of the PSC, 21 of which (77.78%) contain a grapheme with a specified multiple mapping. Interestingly, out of these 21 GPCs, eight (38.09%) represent the multiple mappings of the three graphemes that have not appeared in any of the checks ('ie', 'ou' and 'ue') and thus represent five lower-frequency GPCs that have not been assessed. Of the remaining 13 GPCs, 11 (84.61%) represent the *least* frequent pronunciation of the grapheme with only 2 GPCs (9.52%) representing the *most* frequent pronunciation of the grapheme. Overall, therefore, out of the 39 GPCs that contain a grapheme with a specified multiple mapping, 21 (53.84%) have never been assessed, with 16 (76.19%) of these reflecting the least frequent pronunciation of the grapheme (see Table 6 for the GPCs that have not been assessed).

*How many of the specified multiple mappings are tested in the real words?* Between 2012 and 2014, 60 real words appeared in the PSC. Of the 39 GPCs containing a grapheme

Table 6. GPCs not assessed by the phonics screening check

	Grapheme	Phoneme	Example	Total GPCs
GPCs containing a grapheme with only one specified mapping	au	O:	launch	6
	ay	eI	say	
	e-e	i:	scheme	
	ff	f	cliff	
	ph	f	photo	
	wh	w	when	
GPCs containing a grapheme where none of the associated multiple mappings were tested	ie	i:	chief	8
		aI	pie	
		aU	out	
	ou	@U'	mould	
		u:	you	
		U	could	
ue	ju:	cue	2	
	u:	blue		
GPCs containing a grapheme representing the least frequent pronunciation of a specified multiple mapping	a	A:	father	11
	c	s	cell	
	ch	k	school	
	ch	S	chef	
	e	i:	she	
	ea	E	head	
	g	dz	gem	
	i	aI	mind	
	o	@U'	cold	
	ow	@U'	blow	
u	ju:	unit		
GPCs containing a grapheme representing the most frequent pronunciation of a specified multiple mapping	u-e oo	ju: U	huge look	2
<b>Total</b>				<b>27</b>

with a specified multiple mapping, 15 (38.06%) have been assessed, leaving 24 GPCs that have not yet been assessed within the real words. Overall, the 60 real words represent a total of 246 GPCs, with 79 out of the 246 GPCs (32.11%) containing a grapheme with one or more alternative pronunciations. Out of these 79 GPCs, 66 (83.54%) represent the most frequent pronunciation of the grapheme, with the remaining 13 (16.46%) specifying the less frequent pronunciation. These 13 GPC occurrences reflected only four specified GPCs ('s' in 'lords', 'th' in 'both', 'oo' in 'food' and 'u-e' in 'rude').<sup>7</sup> As such, over the three years of the PSC, children's knowledge of only four less frequent pronunciations of a grapheme have been tested within the real words.

*How many of the specified multiple mappings are tested in the pseudo words?* The 60 pseudo words represent a total of 214 GPCs. Since 2012, 13 out of the 18 graphemes with a specified multiple mapping have appeared within the pseudo words, with these 13 graphemes representing 27 possible GPCs (12 graphemes represented 2 phonemes and 1 grapheme represented 3 phonemes). Overall, out of the 214 GPCs tested, 68 contained a grapheme with one or more alternative pronunciations (146 GPCs contained a grapheme with just a single mapping). For example, the pseudo word 'yop' appeared in 2012 and has 3 GPCs; it could therefore plausibly be pronounced 'yOp' (to rhyme with 'hop') or 'y@Up' as in 'cold'. Either could be correct according to the scoring guidelines provided by the PSC, which state '*alternative pronunciations of graphemes will be allowed for pseudo words*' (DfE, 2014a, p. 14). These 68 graphemes could potentially represent 137 possible GPCs, meaning that a total of 283 GPCs *could* potentially be tested within the pseudo words. Given that any alternative pronunciation of the grapheme would be deemed correct, either the least or most frequent pronunciations of the grapheme *could* be tested in all occurrences.

However, although there are 283 GPCs that *could* be tested, pupils only have to give *one plausible* pronunciation for each grapheme with a specified multiple mapping. This means that every time the check is completed, a proportion of these 283 GPCs will not be tested. For 2012 this equalled 26.8% (26 out of 97); for 2013 it was 22.58% (21 out of 93); for 2014 it was 23.66% (22 out of 93). Thus, although 27 out of the 39 GPCs (69%) that contain a grapheme with a specified multiple mapping *could* be tested within the pseudo words, children could also read the pseudo words based on the most frequent pronunciation of each grapheme. Thus, the pseudo words have assessed children's knowledge of just 13 of the 39 GPCs (33%) containing a grapheme with a specified multiple mapping, with their knowledge of the less frequent pronunciations never specifically being assessed.

*How many alternative pronunciations of the real words are there?* Out of the 60 real words included in the check, 48 (80%) contained at least one grapheme with a specified multiple mapping. For example, whilst the correct pronunciation of 'chip' would reflect the phonemic representation 'tS/I/p', there are five additional alternative pronunciations based on knowledge of the specified mappings (e.g. 'tS/i:/p', 'S/I/p', 'S/i:/p', 'k/I/p', 'k/i:/p'). Indeed, one of these alternative pronunciations 'S/I/p' reflects the real word 'ship'. This is important since, although there are only 60 correct pronunciations of the real words, there are in fact 143 additional alternative pronunciations

(see Table 7 for a summary of the number of alternative pronunciations for each check). Thus, if children are aware of the different pronunciations (i.e. they know ‘ch’ can be pronounced as in ‘**chat**’, ‘**chef**’ or ‘**school**’), they will need additional knowledge to identify the correct pronunciation of the word, as *exclusively* relying on their knowledge of GPCs to decode the word will yield at least three plausible pronunciations of the presented graphemes.

### *Passing the PSC*

This section examines the knowledge needed to pass the PSC in each year between 2012 and 2014.

*Can children pass the check based on knowledge of just one pronunciation per grapheme?* In 2012, 2013 and 2014, children who correctly decoded 32 words or more out of 40 (80%) were considered to have passed the check (DfE, 2014b), with those scoring below this standard being required to retake the check the following year. Here we examine whether children could meet the expected standard if they only had knowledge of one pronunciation for each grapheme that appeared within the check. More specifically, we examined whether children could pass the PSC without any knowledge of multiple mappings.

As previously stated, there are 64 graphemes that could appear within the PSC, representing 85 GPCs. Forty-six of these graphemes had one specified mapping and so represented 46 GPCs, with the remaining 18 graphemes being associated with multiple mappings that represent 39 GPCs. Using the frequencies calculated by Gontijo *et al.* (2003), if pupils only had knowledge of the most frequent pronunciation of the 18 graphemes representing two or more phonemes (see Table S4 in the supplementary material for the probabilities associated with each pronunciation of the graphemes), then they could have scored 36 (90%) out of the 40 items in 2012, 37 (92.5%) in 2013 and 34 (85%) in 2014 (see Table S3 in the supplementary material for a summary of the words that can be decoded). Therefore, children could achieve the expected pass mark for all three years of the PSC if they only had knowledge of the most frequent pronunciation for each grapheme (see Table 8 for the real words that could not be decoded).

### **Discussion**

The implementation of the PSC reflects the current emphasis in England on a systematic synthetic phonics approach to the teaching of early reading. With this approach, the initial focus is placed purely on the ability to decode phonically, with a shift to understanding only occurring when children have mastered the alphabetic code (Rose, 2006). The PSC aims to assess children’s capacity to decode phonically regular text through: (i) stating the appropriate phoneme for graphemes; (ii) blending phonemes together; and then (iii) pronouncing the individual words the phonemes represent. Although reviews of the PSC have been carried out by the NFER (Walker *et al.*, 2013, 2014, 2015), little attention has been given to the content of the checks and whether they have accurately assessed what they set out to measure. In this paper we therefore examined the GPCs tested during the first three years of the PSC to

Table 7. Summary of the number of multiple mappings associated with the real words

Year	No. of GPCs in the real words	GPCs containing a grapheme with one specified mapping		GPCs containing a grapheme with multiple specified mappings		GPCs representing the most frequent pronunciation of the grapheme		GPCs representing the least frequent pronunciation of the grapheme		Number of pronunciations associated with the real words		
		Total	%	Total	%	Total	%	Total	%	Correct	Alternative	Total
2012	81	58	71.60	23	28.40	19	82.61	4	17.39	20	34	54
2013	84	55	66.67	29	34.52	25	86.21	4	13.79	20	61	81
2014	81	54	66.67	27	33.33	22	81.48	5	18.52	20	48	68
All years	246	167	68.29	79	32.11	66	83.54	13	16.46	60	143	203

Table 8. Summary of the real words that cannot be decoded without knowledge of multiple mappings

Words	Year	Phonological representation	No. of GPCs in the word	No. of GPCs representing the most frequent pronunciation of the grapheme	No. of GPCs representing the least frequent pronunciation of the grapheme	Which GPC reflects the least frequent pronunciation?	
						Grapheme	Phoneme
flute	2012	[flu:t]	4	3	1	u-e	u:
lords	2012	[lO:dz]	4	3	1	s	z
shrubs	2012	[SrVbz]	5	4	1	s	z
thorn	2012	[TO:n]	3	2	1	th	T
fuel	2013	[fjU@l]	4	2	2	u e	jU @'
tantrum	2013	[t&n][tr@m]	7	6	1	u	@'
thin	2013	[TIn]	3	2	1	th	T
crowds	2014	[kraUdz]	5	4	1	s	z
drink	2014	[drINk]	5	4	1	n	N
doom	2014	[du:m]	3	2	1	oo	u:
fighters	2014	[faI][t@z]	5	4	1	s	z
rude	2014	[ru:d]	3	2	1	u-e	u:
think	2014	[TINK]	4	2	2	th n	T N

evaluate whether the intentions of the 'check' have been met and the implications these have for teaching early reading.

*Does the PSC phonic screening check reflect the range of GPCs taught by a systematic synthetic phonics approach?*

The technical report for the PSC (DfE, 2012a) identified 85 GPCs that could be assessed within the check. These GPCs reflect those taught through five government-approved systematic synthetic phonics programmes, with 39 of these GPCs containing a grapheme with a specified multiple mapping (i.e. an alternative pronunciation of the grapheme). Given this focus on GPCs taught within approved systematic synthetic phonics programmes, including the emphasis on the teaching of alternative pronunciations, we explored whether the PSC has assessed the range of GPCs specified. Indeed, as stated in the assessment framework, 'over time, the phonics screening check will include all single letters of the alphabet and all grapheme-phoneme correspondences listed in this document' (DfE, 2012b, p. 8).

Over the three years of the PSC, 27 (31.7%) of these 85 GPCs have not yet appeared in any of the checks. Out of the 58 GPCs that have appeared, the 15 most

frequently occurring GPCs account for 67.4% of the total number of GPCs tested, with the remaining 43 GPCs accounting for only 31.5%. Although the statutory requirements of the current National Curriculum state that children should learn ‘*alternative sounds for graphemes*’ (DfE, 2013a, p. 20), only 18 (46.2%) out of the 39 GPCs containing a grapheme with a multiple mapping have been tested. Most importantly, 13 (72.2%) of these 18 GPCs reflect the most frequent pronunciation of the grapheme. As stated in the assessment framework for the PSC, ‘*to meet the minimum expected standard children should be able to decode some items containing less frequent and less consistent vowel digraphs*’ (DfE, 2012c, p. 6). Yet, children could achieve (and surpass) the expected standard of 32 in all three years of the PSC using knowledge of only *one* pronunciation for each of the graphemes that appeared within the check, with this being the most frequent pronunciation where a multiple mapping was specified.

In relation to the purpose of the PSC, this means that children are able to successfully demonstrate their ability to decode phonically even if they do not yet possess knowledge of multiple mappings or knowledge of less frequent GPCs. As such, the PSC can be described as a measure of decoding, since it allows children who may not possess knowledge of a large number of GPCs to demonstrate a capacity to decode and blend phonemes together accurately. This is in line with recent research by Duff *et al.* (2015), who found that the results of children aged 5 to 6 on the PSC were highly correlated with standardised measures of phonic ability. However, whilst this means that the PSC can be described as a measure of decoding, it cannot be seen to measure or reflect children’s knowledge of the GPCs taught in the government-approved systematic synthetic phonic programmes. Although the PSC was specifically introduced to promote ‘*the teaching of systematic synthetic phonics*’ (DfE, 2012b, p. 5), the multiple mappings and low-frequency GPCs taught and encouraged by the government-approved approaches are not needed to pass the PSC.

It is worth noting that these GPC occurrences are based on the most likely pronunciation of the pseudo words given their orthographic structure. Yet, pseudo words are specifically used in the PSC because they are not ‘real’ words and so the reading of them relies solely on children’s GPC knowledge (DfE, 2012b). As specified in the scoring guidance, ‘*alternative pronunciations of graphemes will be allowed in pseudo words*’ (DfE, 2014a, p. 14). On encountering the pseudo word ‘*fo*t’, children could provide either pronunciation of the ‘*o*’ to be considered correct (the more frequent pronunciation to rhyme with ‘*ho*t’ or the less frequent to rhyme with ‘*go*’). As such, the presence of graphemes with specified multiple mappings in the pseudo words could test children’s knowledge of alternative less frequent pronunciations. However, in each PSC children only have to offer *one* plausible pronunciation for each pseudo word to be marked correct. Pupils could therefore gain full marks in decoding pseudo words without ever having to demonstrate any knowledge of their less frequent alternative pronunciation. There is, therefore, no guarantee that pupils’ knowledge of the full range of GPCs advocated is being tested by the PSC.

Indeed, in order for the PSC to effectively assess children’s knowledge of less frequent multiple mappings, changes would be required to either the content of the check or the way in which pseudo word reading is assessed. First, real words that contained graphemes with multiple mappings would have to specify the less frequent

pronunciation (‘**chef**’ would test children’s knowledge of the less frequent pronunciation of the digraph ‘ch’ compared to using ‘**chip**’, which assesses the most frequent). In relation to the pseudo words, if the PSC allows ‘*alternative pronunciations for graphemes in pseudo words*’ (DfE, 2014a, p. 14), then children would need to provide all possible pronunciations associated with the word to ensure their knowledge of the less frequent mappings was being tested. For example, on encountering the pseudo word ‘**fo**t’ (2013 PSC), children would be required to give both pronunciations of the word reflecting the two mappings of ‘o’ (‘yOp’ to rhyme with ‘hop’ or ‘y@Up’ as in ‘cold’). However, pronouncing ‘fot’ based purely on GPCs fails to acknowledge that reading in English is governed by more than letter–sound correspondences (e.g. Goswami *et al.*, 2005). Indeed, if the context of the word (i.e. the surrounding letters) is taken into account, then there is only one pronunciation of the ‘o’ that would be correct based on English orthography. As such, for the pseudo words to effectively assess children’s knowledge of multiple mappings (without requiring children to provide multiple pronunciations), the ‘correct pronunciation’ would have to reflect the less frequent pronunciation of the grapheme governed by not only GPC knowledge but also larger units in English. This change, however, would not reflect a systematic synthetic phonics approach, as children would be required to draw on more than their GPC knowledge to read the words.

Such changes to the content and structure of the PSC would not be required if the only aim of the PSC was to assess children’s ability to phonically decode. However, the PSC also aims to ensure children’s systematic synthetic phonic knowledge is ‘*on track*’ (DfE, 2010a, p. 43). Yet, as it stands, neither the real words nor the pseudo words reflect the GPCs taught by a systematic synthetic phonics approach. As demonstrated by the frequency of GPC occurrences across the PSCs, there are a small number of GPCs that occur highly frequently, with these GPCs accounting for the majority tested over the three years. This contrasts with the frequency of GPC occurrences set out in the assessment framework, which states that the ‘*inclusion of a particular grapheme will not necessarily be in proportion to its frequency in words*’, giving the example ‘*the letter “t” will not necessarily appear more frequently than the letter “x” even though it is more common within words experienced by children at the end of Year 1*’ (DfE, 2012b, p. 8). Indeed, over the three years of the check, ‘t’ occurs 35 times and accounts for 7.6% of the total number of GPC occurrences, with ‘x’ only appearing once and accounting for 0.22%. Rather than the PSC giving equal weighting to GPCs and assessing high and low-frequency GPCs across a similar number of items, the frequency of GPCs instead reflects the pattern found in naturally occurring written English, whereby a small proportion of GPCs occur frequently and a large proportion of GPCs occur with relatively low frequency (Vousden, 2008). As such, although the PSC aimed to assess equally the GPCs deemed suitable to be in the PSC, it has instead tested children’s knowledge of a small number of frequently occurring GPCs. Therefore, there appears to be a contradiction between the purpose and content of the check, as the current content reflects the occurrence of GPCs in naturally occurring written English (see Vousden, 2008; Vousden *et al.*, 2011) rather than the GPCs taught within government-approved synthetic phonics programmes.

This is important when considering the current teaching of early reading as, whilst the content of the PSC appears to reflect those GPCs used most frequently in written English, teachers are currently encouraged to give equal weighting to GPCs regardless of their frequency in written English. Classroom time is spent teaching ‘*all major grapheme–phoneme correspondences*’ (DfE, 2010b, p. 2) because they are part of a synthetic phonics approach which is emphasised by the PSC. If the frequency of GPC occurrences in the PSC were to accurately reflect a systematic synthetic phonics approach to teaching early reading, then low-frequency GPCs (including multiple mappings) would appear as frequently as high-frequency GPCs both within each PSC and across the years of the PSC. Such a change to the content of the PSC, however, seems counterintuitive, as classroom time would be devoted to teaching low-frequency GPCs which, although appearing in the PSC, would nevertheless have low utility in real reading.

What is particularly interesting, however, about the current content of the PSC is that it appears to have consistently reflected the theory of rational analysis, which suggests that reading instruction should help pupils become used to the structure of a language, with teaching curricula reflecting the statistical properties of that language (see Anderson, 1990; Brown, 1998; Vousden, 2008). As demonstrated by the ‘simplicity principle’ (Vousden *et al.*, 2011), within the English language, knowledge of a small number of GPCs can be used to read a large proportion of written text, with no advantage of learning additional GPCs after a certain level, since the number of readable words does not significantly increase (see also Chen & Savage, 2014; Shapiro & Solity, 2016). In relation to teaching early reading, it is suggested that the emphasis should be placed on teaching the most frequent mappings within a language, as these will be encountered on a regular basis and therefore allow children to decode a large amount of text (Vousden, 2008; Solity & Vousden, 2009). In the classroom context therefore the focus would be placed on teaching high frequency GPCs with vocabulary knowledge facilitating pupils’ decoding of words containing low frequency GPCs (Vousden *et al.*, 2011).

Given the consistency of this pattern of GPC occurrences in all three years of the PSC, it raises an interesting question about whether this phenomenon should be acknowledged. More specifically, rather than change the content of the PSC so that it reflects the full range of GPCs currently advocated (even though some are of such low frequency as to be of little value to beginning readers during their first two years in school), changes instead could be made to the context of the PSC and what is *taught* within synthetic phonic programmes so that the focus is placed on those GPCs that occur most frequently, and are therefore most useful. As demonstrated by recent reviews, whilst systematic phonics instruction demonstrates significant effects in helping children to read, no differences have been found between the different methods of systematic phonics instruction (National Reading Panel, 2000; Ehri, 2003; Togerson *et al.*, 2006). As such, whilst the PSC could continue to be seen within the context of promoting systematic synthetic phonics instruction it would no longer be used for, or seen to be an assessment of, one specific approach to teaching synthetic phonics. Rather, the PSC would be used as an assessment of children’s decoding skills, allowing teachers to gauge pupils’ knowledge of the most useful GPCs when applied to real reading.

*Are children only using decoding skills to read the words?*

The phonics screening check includes 20 pseudo words and 20 real words perceived to be ‘less common’, to ensure that children are not relying on ‘visual memory of the words or vocabulary knowledge’ to help them read words accurately (DfE, 2012b, p. 8). Children’s ability to pass the check should therefore only be dependent on their knowledge of GPCs and their capacity to blend sounds together.

Within the literature on reading development, the reading of pseudo words or non-words has long been seen as the purest measure of decoding ability. Pseudo words have no associated meaning and so decoding them can only be dependent on knowledge of letter–sound patterns (e.g. Nation & Snowling, 1998; Tunmer & Chapman, 2011). However, whilst the reading of the pseudo words can be seen as a ‘pure’ assessment of children’s decoding skills, this is not so clear with real words. Although there are 60 correct pronunciations associated with the real words, there are 143 additional alternative pronunciations that represent non-word pronunciations. Davis (2012, 2013) argues that it is the presence of these alternative pronunciations, which undermines the validity of the real words as a test of pure decoding ability. For example, the grapheme ‘ow’ in ‘brown’ (included in the 2014 phonics check) can be pronounced in one of two ways (to rhyme with ‘cow’ or ‘slow’). If a child is aware of these two pronunciations, then they will need to draw on more than GPC knowledge to pronounce the word correctly. Identifying the correct pronunciation is reliant on the word being familiar to the child or in their vocabulary. A child who does not know the meaning of the word ‘brown’ would not know which of the two possible pronunciations is correct. Whilst a child who pronounces ‘brown’ to rhyme with ‘slow’ cannot be considered correct (as the word does not reflect a word in English), they have demonstrated that they can successfully blend the phonemes that are associated with the graphemes. As such, when several plausible phonically accurate pronunciations are possible, the PSC is not just an assessment of children’s ability to identify sounds and blend them together, but also their ability to identify the correct pronunciation (Davis, 2013).

The content of the PSC therefore highlights the importance of vocabulary knowledge when decoding through a synthetic phonics approach when several pronunciations are possible, through pupils’ accurate application of their knowledge of a full range of GPCs. The theory of ‘set for variability’ (Venezky, 1999) suggests that when encountering unfamiliar words, children use their knowledge of letter–sound correspondences (i.e. phonic knowledge) to form approximate phonological representations. Children’s vocabulary knowledge then allows them to identify alternative pronunciations of target words until one is produced that matches their lexical memory. Thus, children’s vocabulary knowledge plays a crucial role when reading unfamiliar words (e.g. Nation & Snowling, 1998; Tunmer & Chapman, 2012). The PSC currently encourages children to use decoding skills when reading both the pseudo and real words. This emphasis on decoding over meaning has been demonstrated within the classroom, with teachers reporting that they now teach pseudo words in preparation for the check (see Walker *et al.*, 2013, 2014, 2015), following observations that more-able readers failed to read the pseudo words correctly as they attempted to bring meaning to the words (Robert-Holmes, 2015). As such, despite

the crucial role vocabulary knowledge plays in facilitating pupils' phonic decoding skills when reading words where graphemes represent multiple phonemes (e.g. Nation & Snowling, 1998; Tunmer & Chapman, 1998; Venezky, 1999), to pass the PSC children are encouraged to ignore meaning and rely solely on their phonic decoding skills (Davis, 2012, 2013).

## Conclusion

Since the introduction of the check in 2012, around £40m has been spent on the rollout of systematic synthetic phonics programmes (Clark, 2014). Although the PSC is described as a 'light-touch' assessment (DfE, 2014c), there are consequences for both schools and pupils if the expected standards of the check are not met (DfE, 2012a,b; see also Lingard *et al.*, 2013), placing pressure on schools to adopt the British government's interpretation of a systematic synthetic phonics approach to the teaching of early reading (DfE, 2012a,b; see also Robert-Holmes, 2015). Teachers are now expected to teach all 40 phonemes and their graphemes, including a specific emphasis on '*alternative sounds for graphemes*' (DfE, 2013). This is being encouraged, despite a large proportion of these GPCs having a low utility within written English (e.g. Vousden, 2008; Solity & Vousden, 2009). Classroom time is now being given to teaching pseudo words (Walker *et al.*, 2013, 2014, 2015), where the use of vocabulary knowledge is specifically discouraged, despite the crucial role it plays not only in 'real reading' but also in accurate phonic decoding (e.g. Nation & Snowling, 1998; Tunmer & Chapman, 1998; Venezky, 1999). Critics have suggested that this has created an environment of reading without meaning, with accurate decoding through pupils' application of their synthetic phonic skills being valued above all else (Davis, 2012, 2013).

Although the PSC has contributed to this focus on synthetic phonics, what is being taught and encouraged is not reflected or tested within the content of the checks. Children's full knowledge of multiple mappings has not been tested in either the real words or the pseudo words. A small number of GPCs have occurred highly frequently, with children able to pass each year of the check with knowledge of only the most frequent pronunciation of each grapheme (where a multiple mapping is specified). The content of the PSC therefore does not reflect the aims of the PSC, since the GPCs tested do not reflect those taught within the government-approved systematic synthetic phonics approach. Furthermore, students' ability to read words (where graphemes represent multiple mappings) is not only dependent on their decoding skills, but also their vocabulary knowledge. For the PSC to better reflect the government's approach, the check would need to assess GPCs that are of lower frequency in written English, particularly when graphemes represent more than one phoneme. Yet, such a change would mean classroom time would continue to be spent on GPCs which have a low utility in the process of real reading. An alternative approach would therefore be to use the current content of the PSC to refine and make changes to what is currently taught through synthetic phonics so that there is an increased focus on the most frequently occurring GPCs. In its current form therefore, questions need to be asked about the purpose and worth of the PSC, since the existing content not only fails to assess the full range of skills English schools are currently being encouraged to teach, but also fails to recognise the importance of vocabulary knowledge in helping

children to identify the correct pronunciation of real words that contain graphemes with multiple phonemes.

## NOTES

- <sup>1</sup> Jenny Chew, Ruth Miskin, Rhona Stainthorpe and Morag Stuart.
- <sup>2</sup> These programmes are Sound Discovery, Speed Sounds (Read Write Inc.), Letters and Sounds, Jolly Phonics and Phonics International.
- <sup>3</sup> Whilst the pilot framework for the 'phonic screening check' refers to the '42 phonemes of English' (DfE, 2012a, p. 15), we identified 44 phonemes in relation to the 85 GPCs considered suitable to be in the check.
- <sup>4</sup> We will return to the issue of multiple pronunciations later in the analysis as they have important implications in relation to the testing of multiple mappings.
- <sup>5</sup> Four additional GPCs that were not specified within the assessment framework (DfE, 2012b) accounted for the remaining 1.09% of the total GPCs tested.
- <sup>6</sup> There were four additional GPCs not specified as being testable by the assessment framework (DfE, 2012b), which accounted for the remaining 1.09%.
- <sup>7</sup> Included in this total are three GPCs not specified as being testable by the check but which appeared in the words and represent a less frequent pronunciation of the grapheme; 'u' as 'jU' in 'fuel', 'u' as '@' in 'tantrum' and 'e' as '@' in 'fuel'.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**Table S1:** Grapheme-phoneme correspondences which can be tested by the 'phonic screening check' as included in the assessment framework for the development of the phonic screening check (DfE, 2012b)

**Table S2:** Phonological representations for each of the pseudo-words tested in the 2012, 2013 and 2014 phonic screening checks.

**Table S3:** Phonological representations for each of the real words tested in the 2012, 2013 and 2014 phonic screening checks

**Table S4:** The Grapheme-Phoneme probabilities for each of the GPCs included in the phonic screening check following Gontijo, Gontijo & Shillcock (2003).

**Table S5:** Frequency of GPC occurrences across each phonic screening check