



Kohnen, S., Colenbrander, D., Krajenbrink, T., & Nickels, L. (2015). Assessment of lexical and non-lexical spelling in students in Grades 1–7. *Australian Journal of Learning Difficulties*, 20(1), 15-38.
<https://doi.org/10.1080/19404158.2015.1023209>,
<https://doi.org/10.1080/19404158.2016.1273961>

Peer reviewed version

Link to published version (if available):
[10.1080/19404158.2015.1023209](https://doi.org/10.1080/19404158.2015.1023209)
[10.1080/19404158.2016.1273961](https://doi.org/10.1080/19404158.2016.1273961)

[Link to publication record in Explore Bristol Research](#)
PDF-document

This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Taylor & Francis at <http://www.tandfonline.com/doi/full/10.1080/19404158.2015.1023209>. Please refer to any applicable terms of use of the publisher.

University of Bristol - Explore Bristol Research

General rights

This document is made available in accordance with publisher policies. Please cite only the published version using the reference above. Full terms of use are available: <http://www.bristol.ac.uk/red/research-policy/pure/user-guides/ebr-terms/>

Assessment of lexical and nonlexical spelling
in students in Grades 1-7

Saskia Kohnen

Danielle Colenbrander

Trudy Krajenbrink

and

Lyndsey Nickels

ARC Centre of Excellence in Cognition and its Disorders, Department of Cognitive Science,
Macquarie University, Australia

Address for correspondence: Saskia Kohnen, Department of Cognitive Science, Macquarie
University, Sydney NSW Australia 2109. Email: Saskia.Kohnen@mq.edu.au

Acknowledgements:

This research was supported by an ARC Discovery Grant to the first and last authors. The first author was funded by a Macquarie University Research Fellowship. The last author was funded by an ARC Future Fellowship. We would like to thank the students, their teachers and school for their participation in this research. Thank you also to our testers.

Abstract

The main aim of this study was to develop standardised tests that assess some of the most important spelling skills for children in primary school: sound-letter mappings (non-lexical spelling) and word spelling accuracy (lexical spelling). We present normative comparison data for children in Grades 1–7 as well as measures of validity and reliability for both tests. Another aim of this study was to assess the relative prevalence of spelling difficulties that only affect one skill selectively (only lexical or only non-lexical spelling) or both. We found that throughout Grades 1–7, children were as likely to have selective as they were to have mixed difficulties. This underscores the importance of measuring lexical and non-lexical skills separately. The tests presented in this paper provide teachers and clinicians with the necessary tools to do exactly that.

In addition to learning to read, learning to spell is arguably one of the main achievements of schooling in the primary years. Ideally, over the course of their school career, students should acquire the knowledge that is necessary to become skilled spellers. Skilled spelling is a complex ability which relies on several sources of knowledge. In the English orthography, there are at least five relatively distinct sources of knowledge that contribute to accurate spelling (e.g. Bourassa & Treiman, 2001; Egan & Tainturier, 2011; Joshi, Treiman, Carreker, & Moats, 2008; Kemp, Parrila, & Kirby, 2009; Moats, 2009): (1) knowing how to translate sounds into letters (spelling phonics, or “non-lexical spelling”), (2) orthographic memory (sight word knowledge, or “lexical spelling”), (3) semantic principles, (4) morphology and (5) etymology.

While English orthography has a bad reputation for its irregularity, being able to accurately translate sounds into letters still allows correct spelling for the majority of letters in the majority of words. In the vocabulary used in primary school, an estimated 50–80% of letters are predictable from their sounds (Hanna & Moore, 1953; Joshi et al., 2008). Hence, at least at this age, non-lexical spelling may be the single most important source of generating accurate spellings in English. However, English sound-letter mappings are not perfectly predictable: many sounds can be spelled in more than one way (e.g. neat, feet, Pete; corn, dawn, haunt). It is therefore often impossible to spell words correctly by just relying on the translation of sounds into letters. Accurate spelling of many words, including some of those that are most common (e.g. was, said, enough), relies on lexical knowledge, that is, orthographic long-term memories for words.

In addition to non-lexical and lexical knowledge, there are at least three more dimensions that can help with accurate spelling. First, words can have similar spellings because they are related in meaning (health is semantically related to heal). Second, knowledge of morphological principles allows spellers to generate accurate spellings for words that differ phonologically. For example, -ed marks the past tense in kicked, roamed

and batted, even though the pronunciation of -ed is different (-t, -d and -id, respectively). Morphological changes also guide many spelling rules (e.g. dropping final -e in wasting but not in wasteful). Third, knowledge of word origins can increase spelling accuracy for words derived from this same origin. For example, knowing the Greek root 'deca' [meaning ten] can help spell words such as decade, decimal (Moats, 2005).

While all five sources of knowledge will help good spellers, arguably, reliance on lexical and non-lexical knowledge can provide accurate spellings for the vast majority of words. For example, while knowing word origins can help someone to spell decade and decimal, this is not necessary for someone who has adequate stored lexical knowledge (i.e., long-term memories) for these words. In fact, every word for which the speller has a long-term memory can be spelled correctly. Nevertheless, knowledge of non-lexical sound-letter mappings remains important as, throughout our lifetime, we continue to be required to produce spellings for words that are new to us (e.g. names of streets, cities, people and products). Initially, we may have to generate a spelling for these new words before forming a lexical representation. Given the importance of these two sources of knowledge (i.e., lexical and non-lexical), it is essential to not only teach but also monitor (i.e., assess) acquisition of these skills throughout the school year.

In a review of spelling assessments (Kohnen, Nickels, & Castles, 2009), we concluded that the nonword spelling test from the Queensland Inventory of Literacy (QUIL; Dodd, Holm, Oerlemans, & McCormick, 1996) was one of the purest measures (available to teachers and providing Australian norms) to assess non-lexical spelling knowledge. However, norms for the QUIL are now relatively old (published in 1996). The QUIL provides a means to determine whether non-lexical skills are within or below the range of what would be expected for a student from a certain grade. Critically, however, the test does not provide any information about which aspects of non-lexical skills (i.e., which sound-letter mappings) have been successfully acquired and which remain to be learned, and may need to be a specific focus of

teaching. As far as lexical skills are concerned, our review concluded that there was no current test that allows unambiguous assessment of lexical spelling skills (Kohnen et al., 2009).

Thus, the first aim of this paper was to provide separate measures of lexical and non-lexical spelling skills along with new normative comparison data (see Appendices A–F). To this end, we developed two new tests and administered them to 648 children in Grades 1–7. One test consists entirely of nonwords and assesses non-lexical spelling skills (the Diagnostic Spelling Test – nonwords: DiSTn). The DiSTn can also be used to assess which sound-letter mappings a child can or cannot apply consistently. The other test consists entirely of words that contain at least one letter whose spelling does not follow the most common sound-letter mapping in English: that is, it comprises words that have irregular spellings. Consequently, these words can only be spelled correctly using stored lexical knowledge and thus the test assesses lexical spelling skills (the Diagnostic Spelling Test – irregular words: DiSTi). Both tests are available online, free of charge (www.motif.org.au).

As mentioned earlier, most current spelling tests do not assess non-lexical and lexical skills separately (see Kohnen et al., 2009 for details). This has partly been justified on the basis that most children are said to be affected by multiple deficits to their spelling system rather than selective deficits to either lexical or non-lexical spelling. Another potential reason is that researchers do not agree whether studying selective disorders in developmental populations is meaningful (e.g. Bishop, 1997; but see Castles, Kohnen, Nickels, & Brock, 2014). If it were true that developmental spelling difficulties always affect all skills that need to be acquired (e.g. both lexical and non-lexical spelling), then it would not be necessary to assess different skills separately in order to identify poor spellers. However, there are many published reports of children who do have selective difficulties in acquiring a certain subskill of spelling. For example, some children have difficulties acquiring lexical spelling, but show normal non-lexical skills. These “phonetic spellers” tend to misspell irregularly spelled words (e.g. “enough” as enuf) but have no difficulties spelling nonwords (e.g. fergruff). This is referred to

as developmental surface dysgraphia (e.g. Brunson, Coltheart, & Nickels, 2005; Hanley, Hastie, & Kay, 1992; Kohnen, Nickels, Coltheart, & Brunson, 2008b; Romani, 1999; Temple, 1985). Another group of children show the opposite pattern: They have difficulties with non-lexical spelling but their lexical knowledge can be age-appropriate. These children often write words when asked to spell nonwords (e.g. “suts” as sits) and their misspellings do not represent the sound structure of the input very well (e.g. “eight” as eahgt). This difficulty is called developmental phonological dysgraphia (e.g. Campbell & Butterworth, 1985; Snowling, Stackhouse, & Rack, 1986; Temple, 1990).

It is often claimed that the combination of lexical and non-lexical spelling difficulties (also called “mixed dysgraphia”, e.g. Kohnen, Nickels, Brunson, & Coltheart, 2008a) is the most common developmental spelling difficulty. Robinson and Weekes (1995) found that 54% of their sample of poor English spellers aged 7–14 had a selective spelling impairment (either just for irregular words or just for nonwords) with the remaining 46% showing an impairment for both types of items. Interestingly, a recent study with Italian children showed that the type of spelling impairment differed across the two grade levels assessed: while younger children with spelling difficulties (in Grade 3) tended to show the mixed dysgraphia pattern, older children (in Grade 5) predominantly showed a lexical spelling difficulty (Angelelli, Notarnicola, Judica, Zoccolotti, & Luzzatti, 2010). To the best of our knowledge, there are no data that show whether younger English speaking children have different types of spelling difficulties to older children. This knowledge is important for educators as it may guide planning of both assessment and intervention.

In this study, we aimed to assess how many children in our sample showed (1) just non-lexical spelling difficulties, (2) just lexical spelling difficulties or (3) mixed spelling difficulties. We also investigated whether the proportion of children with these three patterns of spelling difficulty changed over Grades 1–7.

We will begin by describing the two tests and normative comparison data. In the second part of the paper, we will return to the questions of prevalence of different spelling difficulties.

Method

Tests

Diagnostic Spelling Test – nonwords (DiSTn)

We created 74 monosyllabic nonwords such that each of 40 English phonemes occurred at least twice across the set. For example, the spelling of the phoneme /i/ is tested five times, once in each of the nonwords mip, gib, rizz, thiff and tring. All 74 test items are presented one at a time, to spell to dictation. The tests can be administered individually or in a group setting (see Appendix G for instructions and details of the administration).

A response is either scored as correct or incorrect. Responses are accepted as correct if they accurately represent the sounds in the in the correct order. We based accuracy of the translation from sounds to letters on a frequency count of sound-letter mappings for English words (Perry, Ziegler, & Coltheart, 2002). We accepted spellings that had a type frequency of at least 20 per 7981 used in this analysis and a token frequency of at least 20,000 out of all words in the CELEX database (Baayen, Piepenbrock, & van Rijn, 1993). In some cases, we accepted spellings that had a lower frequency than criterion on either type or token frequency (but not both) if it was an unambiguous spelling for the sound in question. For example, the spelling ‘wr’ for the sound /r/ had a type frequency of 48 but a token frequency of only 6254 (below our criterion); however, this spelling was accepted as no other sound is spelled ‘wr’. Spellings that were ambiguous and met only one of the frequency criteria (i.e., more than one sound was spelled that way) were only accepted as correct if more than 10% of the normative sample used that spelling to represent a particular sound.

Some spellings are context-sensitive – in other words, the spelling is a correct representation of the sound in some word contexts, but is an incorrect representation in other contexts. For example, ‘ea’ is an acceptable spelling of the sound /e/ as in ‘head’ when it comes before the sounds /d/, /t/ or /lth/, but it is incorrect in other contexts (Kessler & Treiman, 2001). Context-sensitive spellings used in incorrect contexts were not accepted as correct, unless more than 10% of the sample used a context-sensitive rule in an incorrect context to represent a particular sound. Acceptable responses are indicated on the score sheet (see Appendix H).¹

The DiSTn can answer two clinically relevant questions: (1) Is a child’s nonword spelling accuracy at the level it is supposed to be given this child’s grade? (2) Which particular sound-letter mappings does a child struggle with?

The DiSTn can be administered with or without a stopping rule. In order to answer only question (1), data with the stopping rule should be sufficient. In order to answer both questions (1) and (2), all items should be administered.

Diagnostic Spelling Test irregular words (DiSTi)

This test comprises 74 words that contain at least one ambiguous or irregular sound-letter mapping (e.g. said, school, daughter). See Appendix I for details on administration and instruction. Test items are presented in Appendix J. The ambiguity or irregularity of sound-letter mapping was determined with reference to two papers that have analysed frequencies of sound-letter mappings (Fry, 2004; Perry et al., 2002). The most frequent sound-letter mapping in each of these analyses was considered to be a regular mapping, while mappings that were not the most frequent on either list were considered to be irregular. All items in the DiSTi contained at least one phoneme-grapheme correspondence that was not the most regular or frequent spelling according to frequency counts by either Fry (2004) or Perry et al. (2002). All but 14 words in the test are listed in the Oxford Wordlist Database (<http://www.oxfordwordlist.com>). This database consists of words that Australian primary school children

use in their free writing samples. Data collection was conducted by Oxford University Press (Australia and New Zealand) in 2007. The Oxford Wordlist only covers data up to Grade 4. Yet, some of the words, are probably not spelled correctly until much later (e.g. dinosaur, weird). Nonetheless, since we wished to create a test that could also be applied in higher grades, we selected additional words with irregular spellings whose spoken word forms are acquired by the age of 13 (Kuperman, Stadthagen-Gonzalez & Brysbaert, 2012).

For each word in the DiSTi, the tester reads the word aloud in isolation, then the word is presented in a sentence and finally, the word is presented once more in isolation (e.g. ‘Said. She said “yes”. Said.’). A stopping rule applies once the speller makes five consecutive errors.

The test can be administered individually or in a group setting (see Appendix I for instructions and details of the administration). The DiSTi can also be administered online in a one-to-one testing session (www.motif.org.au). Responses are typed into a computer by the child (or written by hand by the child and typed by the tester) and a program will compute accuracy and normative comparison data.

Normative comparison data

Sample

The norming sample for the DiSTi and DiSTn consisted of 645 and 641 children respectively, from Grades 1–7 at three schools (two primary schools and one high school) in Sydney in the state of New South Wales, Australia. Data were collected in 2010. The two primary schools were situated in lower to middle socio-economic areas of Sydney and the high school was situated in a higher socioeconomic area of Sydney (Australian Bureau of Statistics, 2006). All schools had performed in the average range in the nationwide National Assessment Program Literacy and Numeracy (NAPLAN) in 2009. The schools used a mixture of instructional procedures including specific teaching of spelling rules and spelling lists.

All children who were present at school at the time of testing and whose parents had

provided consent were included in the sample. Data from children were excluded if testing was discontinued early (see Procedure section below), if a child made no response to more than half of the items, or because responses were illegible. This led to the exclusion of DiSTi data from three children, and DiSTn data from eight children. The final sample consisted of 642 children with complete DiSTi data, and 633 children with complete DiSTn data. In total, 629 children completed both tests. The sample demographics for the children completing the DiSTi and DiSTn are presented in Table 1.

Procedure

Testing was carried out in September and October 2010 at the start of term 4. This study was part of a larger study during which normative control data were obtained for a number of tests. The tests were administered by trained testers and took place in the participating schools. Testers were native English speakers, and trained to administer the tests by the first author. Testing was carried out over 3 weeks.

School classes were split in half so that children could be tested in smaller groups of around 10–15 children. The class teacher allocated children to groups according to spelling ability (high vs. low) so as to make it easier for the tester to administer the test at an appropriate rate. All groups completed the DiSTn and DiSTi in the same session. The

Table 1. DiSTi and DiSTn normative sample demographics.

Grade	Age range (years: months)	Median	DiSTi		DiSTn	
			No of children	Boys: girls	No of children	Boys: girls
Grade 1	6:2–8:2	7:0	76	48:28	69	41:28
Grade 2	6:1–8:10	8:0	75	30:45	78	30:48
Grade 3	8:2–9:9	8:11	84	39:45	82	38:44
Grade 4	7:10–10:9	10:0	87	46:41	87	47:40
Grade 5	10:0–12:1	11:0	96	59:37	95	58:37
Grade 6	11:3–12:11	12:0	93	54:39	93	54:39
Grade 7	11:11–14:5	13:1	131	67:64	129	65:64

Note: Age range applies to both DiSTi and DiSTn samples

order in which tests were administered was counterbalanced across groups and grades. Children spelled all items on the DiSTn and test scorers applied the stopping rule when scoring the data later. A stopping rule of five consecutive errors was applied to the DiSTi at the time of testing. In order to be able to administer the test and apply the stopping rule to individual students, the testers had a clipboard with the items. They moved around the classroom and marked incorrect responses at the time of testing.

Literacy skills of the normative control sample

Test of Word Reading Efficiency (TOWRE) sight word and nonword reading data were available for 479 children in Grades 1–6 who had completed both the DiSTi and DiSTn. The TOWRE is a reading fluency test and was administered in the same week as the DiSTi and DiSTn as part of a study developing Australian-based norms for this test (Marinus, Kohnen, & McArthur, 2013). The TOWRE measures the ability to quickly and accurately read familiar words (sightwords, e.g. dog, here, everyone) and novel words (nonwords, e.g. teap, marl, thundelp). Items get longer and more complex as the test goes on. There are 104 sightwords and 63 nonwords. Table 2 shows the means and standard deviations for each grade level. The mean standard score on the TOWRE is 100 and the standard deviation is 15. As can be seen from Table 2, the groups of children tested for this study showed scores very close to the population mean of 100 (using the original American norms: Torgesen, Wagner, & Rashotte, 1999). Similarly, standard deviations are close to the population standard deviation of 15. This indicates that, as a group, children in Grades 1–6 had average lexical (sightword) and non-lexical (nonword) reading abilities.

Results

Table 3 provides summary statistics for the mean raw scores for the DiSTi and DiSTn for each grade level.

Effects of age and gender on performance

DiSTi: In order to look at the effects of grade and gender on DiSTi scores, we ran a two-way between-groups ANOVA. There was a significant main effect of grade, $F(6, 628) = 110.00, p < 0.001$, but no significant main effect of gender (boys: mean = 36.06, SD = 18.96; girls: mean = 34.60, SD = 20.42), $F(1, 628) = 3.277, p = 0.07$, nor an interaction, $F(6, 628) = 0.83, p = 0.55$.

Table 2. TOWRE age based standard scores for children with both DiSTi and DiSTn data.

Grade	No of children	DiSTn ^a		TOWRE	
		M (SD)	M (SD)	Sightwords SS (SD)	Nonwords SS (SD)
Grade 1	66	10.4 (9.4)	25.9 (14.0)	105.8 (13.5)	103.2 (14.0)
Grade 2	70	18.9 (10.6)	33.8 (13.5)	105.5 (12.6)	99.0 (11.7)
Grade 3	78	25.7 (13.4)	36.4 (13.5)	106.2 (11.6)	103.1 (11.9)
Grade 4	83	39.4 (15.8)	45.1 (12.3)	104.0 (10.3)	103.8 (13.4)
Grade 5	93	41.1 (16.0)	43.3 (13.6)	100.8 (12.0)	99.5 (15.2)
Grade 6	89	44.3 (15.5)	44.1 (13.3)	100.2 (12.6)	96.3 (13.8)
Total	479				

Note: TOWRE standard scores are based on the American TOWRE norms (Torgesen et al., 1999).

^a DiSTn without stopping rule.

Table 3. Mean item accuracy for DiSTi and DiSTn.

Grade	DiSTi (N [items] = 74)		DiSTn (N [items] = 74) ^a	
	Item accuracy M (SD)	Range	Item accuracy M (SD)	Range
Grade 1	9.3 (9.2)	0–40	25.3 (13.9)	5–62
Grade 2	19.3 (11.2)	1–50	34.3 (13.6)	9–64
Grade 3	25.3 (13.3)	0–59	36.5 (13.45)	5–65
Grade 4	39.4 (15.9)	5–68	45.4 (12.1)	10–64
Grade 5	41.3 (16.0)	3–68	43.3 (13.5)	0–67
Grade 6	44.1 (15.9)	5–70	43.9 (13.1)	9–68
Grade 7	51.9 (13.0)	7–73	44.3 (9.6)	10–64

^a DiSTn without stopping rule.

DiSTn: We then examined the effects of age and gender on DiSTn scores. There was a significant main effect of grade, $F(6, 619) = 26.15, p < 0.001$, but note that children reached a plateau on the DiSTn at Grade 4 (see Table 3). Neither the main effect of gender (boys: mean = 40.50, SD = 14.56; girls: mean = 39.41, SD = 13.72), $F(1, 619) = 1.72, p = 0.19$, nor the interaction, $F(6, 619) = 1.49, p = 0.18$, was significant.

There was a significant positive skew in the data for Grades 1 and 2 on the DiSTi and

there was a significant negative skew for Grade 7 (DiSTi) and Grades 4–7 (DiSTn). In order to address these skews, we converted the raw scores for each Grade into percentile ranks. This was based upon the cumulative frequency distribution. Following this, we converted each percentile rank to its corresponding z-score. In every Grade, there were some raw scores that children did not produce. In these cases, we estimated the missing percentiles using an extrapolation procedure outlined in Castles et al. (2009).

Reliability and validity

Several measures of reliability and validity were calculated for the DiSTi and DiSTn.

Internal consistency

Cronbach's alpha (Cronbach, 1951) was calculated for both the DiSTi and DiSTn data. The DiSTi has a discontinue rule – test administration is discontinued if a child responds incorrectly to five consecutive items. This meant that for many participants, there were no data for items towards the end of the test. Therefore, we calculated Cronbach's alpha using data from participants who completed all test items. By this criterion, 28.8% of the sample completed every item in the test. These were generally participants who were from higher school grades and who were good spellers. Under these conditions, the test has very good internal consistency, $\alpha = 0.94$. However, Cronbach's alpha for the DiSTi should be interpreted with caution as it is not necessarily representative of data from younger children and poorer spellers.

The DiSTn was administered without a discontinue rule, and therefore Cronbach's alpha was calculated from 100% of the sample. The internal consistency of the DiSTn was also very high, $\alpha = 0.94$.

Construct validity

To measure the construct validity of the DiSTi, a partial correlation between DiSTi raw scores and TOWRE Sight Word Efficiency raw scores was computed using grade level as a covariate to control for the effects of years of schooling. If the DiSTi is in fact measuring children's lexical knowledge, we would expect a significant correlation with TOWRE Sight Word Efficiency scores as this, too, is an index of a child's lexical knowledge. However, we would not necessarily expect a strong correlation because one test is measuring lexical knowledge for spelling while the other is measuring lexical knowledge for reading. As predicted, the two tests were significantly, but moderately correlated, $r = 0.61, p < 0.01$.

To measure the construct validity of the DiSTn, a partial correlation between DiSTn raw scores and TOWRE Phonemic Decoding Efficiency raw scores was computed using grade level as a covariate. Again, we would expect a significant, but not necessarily strong correlation between the DiSTn and the TOWRE Phonemic Decoding Efficiency subtest. In this case, a significant and moderate-to-strong correlation was found between the two tests, $r = 0.72, p < 0.01$.

Test–retest reliability

Due to the fact that the norming sample was only assessed once on the DiSTi and DiSTn, no test–retest data were available from the norming sample. However, test–retest data for both tests were available from the Macquarie University Reading Training study (McArthur et al., 2013a). This was a randomised controlled trial assessing the effectiveness of sight word and phonics training for children with dyslexia. As part of this study, participants were tested on the DiSTi and DiSTn at two baseline assessment sessions, eight weeks apart, and before the commencement of reading training. These data were collected from a sample of children with reading difficulties and should therefore be interpreted with caution. However, it nonetheless allows an estimate of the test–retest reliability for both tests. For the purpose of the reading training study, both tests were administered with a stopping rule.

Correlations between children's scores at Test 1 and Test 2 were computed using Spearman's rho as both DiSTi, $D(115) = 0.192, p < 0.01$, and DiSTn data, $D(115) = 0.265, p < 0.01$, were significantly non-normal. DiSTi scores at Time 1 were significantly related to DiSTi scores at Time 2, $r_s = 0.96, p > 0.01$. DiSTn scores at Time 1 were also significantly related to DiSTn scores at Time 2, $r_s = 0.61, p > 0.01$. Correlation coefficients are lower for the nonword spelling test than the irregular word spelling test. This is probably not unusual; a difference in the same direction was also found comparing nonword reading and word reading for the TOWRE (Torgesen et al., 1999).

Summary

The first part of this paper aimed to provide normative control data for two spelling tests, one assessing lexical and one assessing non-lexical skills (see Appendices A–F). As would be expected, there were some improvements on the tests with increasing grade level. Boys and girls did not perform differently on either of the two tests. However, while there was an increase in accuracy across grades, children from grades 4–7 achieved relatively similar scores on the nonwords from the DiSTn. This may indicate that children have acquired the sound-letter mappings assessed in this test by Grade 4. Similarly, there was a general increase in accuracy across grades for the irregular words from the DiSTi. Overall, both tests were shown to be reliable across time and valid in content.

Prevalence of different spelling difficulties

In the second part of this paper, we will examine the prevalence of lexical, non-lexical and mixed spelling difficulties. This analysis is based on the 629 children who completed both the DiSTi and the DiSTn spelling tests. We used the DiSTn without the stopping rule.

We calculated how many children scored below average (i.e. more than one standard deviation below the mean; or in the lowest 15% for their age) on the DiSTi only (indicating lexical difficulties), on the DiSTn only (indicating non-lexical difficulties) or on both tests (indicating a mixed pattern of difficulties). Table 4 displays the result of this calculation by Grade.

Results

The percentage of children who fell below the normal range based on the DiSTi and DiSTn in each grade ranged from 15.9% (Grade 1) to 26.4% (Grade 7). These prevalence data resemble data from previous studies. For example, Landerl and Moll (2010) found that 16.4% of their sample of children in Grades 1–4 scored at least one standard deviation below the population mean on a spelling test. Table 4 shows that there are children across all grades who score in the normal range for one test and below the normal range on another. In total, 8.4% of children across the grades have only lexical spelling difficulties, while 7.9% have only non-lexical spelling difficulties. These numbers are relatively similar. A slightly smaller number (5.7%) show a mixed profile. The finding that the majority of children with spelling difficulties only score below average on one of the two tests is possibly the most important finding of this study as it highlights the importance of using separate measures to assess lexical and non-lexical skills.

Since the number of children who showed a particular spelling difficulty in any one grade was relatively small (ranging from 3 to 17; see Table 4), we combined scores across grades. We divided the sample into Grades 1–3 and Grades 5–6 to compare if there was a significant shift in types of spelling difficulties for the younger as compared to the older students. None of the three types of spelling difficulties we investigated (lexical, non-lexical and mixed) occurred any more often in the younger than the older spellers ($\chi^2(2) = 2.93$ $p = 0.231$). We also compared lexical vs. mixed spelling difficulties for Grades 3 and 5, since these were the grades investigated in the Angelelli study (2009). There were no significant differences (Fisher exact $p = 1.000$, two tailed).

General Discussion

The main aim of this paper was to present two new spelling tests and provide Australian normative comparison data for these tests. One of the tests, the Diagnostic Spelling Test – irregular words (DiSTi) assesses lexical spelling skills while the other, the Diagnostic

Table 4. Overview of children with only lexical (DiSTi), only non-lexical (DiSTn) or mixed (both DiSTi and DiSTn) spelling difficulties.

Grade	Children who completed both tests	No. of children with spelling difficulties (%)	Lexical difficulties (%)	Non-lexical difficulties (%)	Mixed difficulties (%)
Grade 1	69	11 (15.9)	3 (4.3)	5 (7.2)	3 (4.3)
Grade 2	75	14 (18.7)	4 (5.3)	6 (8.0)	4 (5.3)
Grade 3	82	18 (22.0)	6 (7.3)	5 (6.1)	7 (8.5)
Grade 4	86	18 (20.9)	6 (7.0)	6 (7.0)	6 (7.0)
Grade 5	95	21 (22.1)	8 (8.4)	6 (6.3)	7 (7.4)
Grade 6	93	22 (23.7)	9 (9.7)	8 (8.6)	5 (5.4)
Grade 7	129	34 (26.4)	17 (13.2)	13 (10.1)	4 (3.1)
Total	629	138 (21.9)	53 (8.4)	49 (7.8)	36 (5.7)

Note: % = percentage of children with a particular spelling difficulty out of the total number of spellers in a grade (who completed both spelling tests).

Spelling Test – nonwords (DiSTn), assesses non-lexical skills. We have provided normative comparison data from children in Grades 1–7 and found that both tests were consistent, reliable and valid. As expected, there was a significant effect of grade on performance, with children in higher grades performing more accurately. For the DiSTn, performance plateaued at Grade 4, indicating that little additional learning of sublexical skills (at least as tested in the DiSTn) occurs after this point. In contrast, performance on the DiSTi continues to increase in accuracy throughout the grades: this is as would be predicted, given that throughout our lives we continue to acquire new words and their spellings.

This study and the tests we present, however, are not without their limitations. First, data collection did not occur Australia-wide, but rather it was restricted to urban NSW. Given the differences in literacy skills between urban, rural and remote areas in Australia (Australian Curriculum, Assessment and Reporting Authority, 2013), a more

comprehensive data collection would provide more representative norms. Nevertheless, the students in our sample scored very close to the average of a normed and standardised reading test, indicating that our sample was, by and large, representative of the population.

Ideally, educational assessments should have separate norms for each semester or even each term. Restrictions in funding meant that we could only provide yearly norms.

We also acknowledge that the tests are relatively long. For the DiSTi, this problem is mitigated by the stopping rule. While a stopping rule can also be applied to the DiSTn, this will limit its clinical usefulness: it is only by administering all 74 DiSTn items that teachers and clinicians can accurately determine which sound-letter mappings a child has or has not mastered. This knowledge is essential in order to translate the test results into appropriately targeted goals for intervention (e.g. Kohnen et al., 2008a).

Lastly, we only assessed reading-based validity for the two spelling tests, but did not compare the DiSTi and DiSTn against other spelling tests. This was not possible in the context of the current study since we administered various other tests (e.g. McArthur et al., 2013b) and further testing would have over-taxed both children and teachers.

In addition to providing normative comparison data, we also examined changes across grades in the prevalence of selective non-lexical, selective lexical and mixed spelling difficulties in this sample of spellers. A previous study with Italian spellers showed that younger students tended to have mixed spelling difficulties and older students were more likely to have lexical spelling difficulties (Angelelli et al., 2010). We did not replicate this finding in the current sample: there were no changes in the relative prevalence between lower and higher grades of lexical and mixed difficulties. The most obvious difference between the two studies is the level of orthographic transparency, with Italian sound-letter mappings being more predictable than those of English. Possibly, Italian sound-letter mappings are somewhat easier to acquire (even for poor spellers) than is the case in English (also see Wimmer & Goswami, 1994). This may be why we still found children who had

difficulties in non-lexical skills in the higher grades in the English sample while the Italian sample contained almost no children with selective difficulties in acquiring non-lexical skills. This finding highlights the importance of testing (and teaching) non-lexical skills even beyond the primary school years where required.

In sum, there is lack of tests available to teachers that clearly delineate two of the basic spelling skills (Kohnen et al., 2009). However, in this paper we found that there were as many children who have selective difficulties in only lexical skills or only non-lexical skills as there are children who have difficulties acquiring both skills. Hence, assessments that only consist of nonwords will fail to identify children who have difficulties acquiring lexical spelling skills while assessments that only contain words will fail to identify non-lexical difficulties. There is also evidence, at least for reading, that assessments that rely on word lists that contain both regular and irregular words can overestimate lexical abilities (Moore, Porter, Kohnen, & Castles, 2012). Hence, using irregular words, as in the DiSTi, provides a more sensitive measure of children's lexical spelling abilities, which can highlight problems that require appropriate intervention (e.g. Kohnen et al., 2008b). Lastly, tests with mixed regular and irregular words also cannot diagnose non-lexical spelling difficulties (see Kohnen et al., 2009 for a discussion of these issues). We hope that the tests provided here, the DiSTn and DiSTi, will help teachers and clinicians achieve more effective diagnosis and more clearly targeted intervention for those with spelling problems.

Note

1. Further details of the scoring decisions and cut-offs are available from the first author.

References

- Angelelli, P., Notarnicola, A., Judica, A., Zoccolotti, P., & Luzzatti, C. (2010). Spelling impairments in Italian dyslexic children: Phenomenological changes in primary school. *Cortex*, 46, 1299–1311. doi:10.1016/j.cortex.2010.06.015
- Australian Bureau of Statistics. (2006). Census of population and housing: Socio-economic indexes for areas (SEIFA), Australia [Online]. Retrieved from <http://abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2033.0.55.0012006?OpenDocument>
- Australian Curriculum, Assessment and Reporting Authority. (2013). National assessment program – Literacy and numeracy achievement in reading, persuasive writing, language conventions and numeracy: National report. Sydney: ACARA.
- Baayen, H., Piepenbrock, R., & van Rijn, H. (1993). The CELEX database on CD-ROM. Philadelphia, PA: Linguistic Data Consortium.
- Bishop, D. V. M. (1997). Cognitive neuropsychology and developmental disorders: Uncomfortable bedfellows. *The Quarterly Journal of Experimental Psychology: Section A*, 50, 899–923.
- Bourassa, D. C., & Treiman, R. (2001). Spelling development and disability: The importance of linguistic factors. *Language, Speech, and Hearing Services in Schools*, 32, 172. doi:10.1044/0161-1461(2001/016)
- Brunsdon, R., Coltheart, M., & Nickels, L. (2005). Treatment of irregular word spelling in developmental surface dysgraphia. *Cognitive Neuropsychology*, 22, 213–251. doi:10.1080/02643290442000077
- Campbell, R., & Butterworth, B. (1985). Phonological dyslexia and dysgraphia in a highly literate subject: A developmental case with associated deficits of phonemic processing and awareness. *The Quarterly Journal of Experimental Psychology*, 37, 435–475. doi:10.1080/14640748508400944
- Castles, A., Coltheart, M., Larsen, L., Jones, P., Saunders, S., & McArthur, G. (2009). Assessing the basic components of reading: A revision of the Castles and Coltheart test with new norms. *Australian Journal of Learning Difficulties*, 14, 67–88.
- Castles, A., Kohnen, S., Nickels, L., & Brock, J. (2014). Developmental disorders: What can be learned from cognitive neuropsychology? *Philosophical Transactions of the Royal Society B: Biological Sciences*, 369, 20130407.

- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334.
- Dodd, B., Holm, A., Oerlemans, M., & McCormick, M. (1996). *Queensland Inventory of Literacy Inventory*. St Lucia: University of Queensland Press.
- Egan, J., & Tainturier, M. J. (2011). Inflectional spelling deficits in developmental dyslexia. *Cortex*, 47, 1179–1196. doi:10.1016/j.cortex.2011.05.013
- Fry, E. (2004). Phonics: A large phoneme–grapheme frequency count revised. *Journal of Literacy Research*, 36, 85–98.
- Hanley, J. R., Hastie, K., & Kay, J. (1992). Developmental surface dyslexia and dysgraphia: An orthographic processing impairment. *The Quarterly Journal of Experimental Psychology*, 44, 285–319. doi:10.1080/02724989243000046
- Hanna, P. R., & Moore, J. T. (1953). Spelling – From spoken word to written symbol. *The Elementary School Journal*, 329–337.
- Joshi, R. M., Treiman, R., Carreker, S., & Moats, L. C. (2008). How words cast their spell. *American Educator*, 32, 6–43.
- Kemp, N., Parrila, R. K., & Kirby, J. R. (2009). Phonological and orthographic spelling in high-functioning adult dyslexics. *Dyslexia*, 15, 105–128. doi:10.1002/dys.364
- Kessler, B., & Treiman, R. (2001). Relationships between sounds and letters in English monosyllables. *Journal of Memory and Language*, 44, 592–617.
- Kohnen, S., Nickels, L., Brunson, R., & Coltheart, M. (2008a). Patterns of generalisation after treating sublexical spelling deficits in a child with mixed dysgraphia. *Journal of Research in Reading*, 31, 157–177. doi:10.1111/j.1467-9817.2007.00366.x
- Kohnen, S., Nickels, L., & Castles, A. (2009). Assessing spelling skills and strategies: A critique of available resources. *Australian Journal of Learning Difficulties*, 14, 113–150.
- Kohnen, S., Nickels, L., Coltheart, M., & Brunson, R. (2008b). Predicting generalization in the training of irregular-word spelling: Treating lexical spelling deficits in a child. *Cognitive neuropsychology*, 25, 343–375. doi:10.1080/02643290802003000
- Kuperman, V., Stadthagen-Gonzalez, H., & Brysbaert, M. (2012). Age-of-acquisition ratings for 30,000 English words. *Behavior Research Methods*, 44, 978–990.

- Landerl, K., & Moll, K. (2010). Comorbidity of learning disorders: prevalence and familial transmission. *Journal of Child Psychology and Psychiatry*, 51, 287–294. doi:10.1111/j.1469-7610.2009.02164.x
- Marinus, E., Kohnen, S., & McArthur, G. (2013). Australian comparison data for the test of word reading efficiency. *Australian Journal of Learning Difficulties*, 18, 199–212. doi:10.1080/19404158.2013.852981
- McArthur, G., Castles, A., Kohnen, S., Larsen, L., Jones, K., Anandakumar, T., & Banales, E. (2013a). Sight word and phonics training in children with dyslexia. *Journal of Learning Disabilities*. Advance online publication. doi:10.1177/0022219413504996
- McArthur, G., Jones, K., Anandakumar, T., Larsen, L., Castles, A., & Coltheart, M. (2013b). A Test of Everyday Reading Comprehension (TERC). *Australian Journal of Learning Difficulties*, 18, 35–85. doi:10.1080/19404158.2013.779588
- Moats, L. (2009). Knowledge foundations for teaching reading and spelling. *Reading and Writing*, 22, 379–399. doi:10.1007/s11145-009-9162-1
- Moats, L. C. (2005). How spelling supports reading. *American Educator*, 6, 42–43.
- Moore, D., Porter, M. A., Kohnen, S., & Castles, A. (2012). Detecting different types of reading difficulties: A comparison of tests. *Australasian Journal of Special Education*, 36, 112–133. doi:10.1017/jse.2012.11
- Perry, C., Ziegler, J. C., & Coltheart, M. (2002). How predictable is spelling? Developing and testing metrics of phoneme-grapheme contingency. *The Quarterly Journal of Experimental Psychology*, 55A, 897–915.
- Robinson, G. A., & Weekes, B. S. (1995). Subtypes of developmental dysgraphia. In J. Fourez (Ed.), *Brain Impairment: Treatment Issues and Long Term Outcomes* (pp. 65–71). Brisbane, Australia: Australian Academic Press.
- Romani, C. (1999). Developmental surface dysgraphia: What is the underlying cognitive impairment? *The Quarterly Journal of Experimental Psychology: Section A*, 52, 97–128. doi:10.1080/713755804
- Snowling, M., Stackhouse, J., & Rack, J. (1986). Phonological dyslexia and dysgraphia—A developmental analysis. *Cognitive Neuropsychology*, 3, 309–339. doi:10.1080/02643298608253362

- Temple, C. M. (1985). Developmental surface dysgraphia: A case report. *Applied Psycholinguistics*, 6, 391–405. doi:10.1017/S0142716400006329
- Temple, C. M. (1990). Foop is still floop: A six year follow-up of phonological dyslexia and dysgraphia. *Reading and Writing*, 2, 209–221. doi:10.1007/BF00257972
- Torgeson, J. K., Wagner, R. K., & Rashotte, C. A. (1999). *Test of word reading efficiency (TOWRE)*. Austin, TX: ProEd.
- Wimmer, H., & Goswami, U. (1994). The influence of orthographic consistency on reading development: Word recognition in English and German children. *Cognition*, 51, 91–103. doi:10.1016/0010-0277(94)90010-8

Notes: Appendices A–F: Interpreting the norm data

Appendices A–F present normative data for the DiSTi and DiSTn. The tables can be used to determine how a child’s score compares to other children in the same grade. Percentile ranks and Z-scores are provided.

A percentile rank of 75 indicates that the child’s performance is the same as or better than approximately 75% of children in the same grade. A percentile of 50 indicates the average point for the grade. Percentiles between 16 and 84 are generally considered to be in the average range. A percentile of 15 or below is considered below average and a percentile of 85 or above is considered above average.

A Z-score has a mean of 0 and standard deviation of 1, therefore scores between (and including) -1.00 and 1.00 are average. Scores lower than -1.00 are below average and scores above 1 are above average.

To find a child’s percentile and Z-score, locate the child’s raw score in the leftmost column. Then read across the row until you locate the column that shows the appropriate grade. Percentiles and Z-scores are listed for each grade.

Norms for the DiSTi can be found in Appendices A and B. Norms for the DiSTn can be found in Appendices C–F. The DiSTn has two sets of norms. If the DiSTn is administered without a stopping rule, the “Without Stopping Rule” norms (Appendices C and D) should be used. If the DiSTn is administered with a stopping rule, use the “With Stopping Rule” norms (Appendices E and F). Usually, the norms without a stopping rule will be used, as the DiSTn should only be administered with a stopping rule in cases where a child has little or no knowledge of sound-letter mappings.

Grade-based norms were selected for use rather than age-based norms because grade level, or number of years of schooling, seems more relevant to estimate a child’s literacy ability than his/her age: the amount of instruction that children have received is probably more important than their age. For example, a child who is relatively young for their grade would be expected to achieve a similar spelling level as his/her slightly older peers as they have received the same amount of spelling instruction. Similarly, a child who is relatively old for their grade should not necessarily be expected to perform at a higher level than his/her slightly younger peers. However, especially in the younger

grades, age may play some role in learning and attending. In selecting the appropriate grade-based norm for children schooled in Australia, consider the number of terms the child has been at school. In Australia, all states and territories now have compulsory pre-Grade 1 education (e.g. Kindy in NSW, Prep in QLD). However, some of the older children in some states (e.g. in Queensland) may not have received pre-Grade 1 education. The following table shows which norms to use based on the number of terms a child has been at school.

Grade-based norms used according to terms of study.

Terms at school	Grade/Term	Use following norms
1–5	Kindy(NSW)/Prep(QLD) – Grade 1, Term 1	No norm data
6–9	Grade 1, Term 2 – Grade 2, Term 1	Grade 1
10–13	Grade 2, Term 2 – Grade 3, Term 1	Grade 2
14–17	Grade 3, Term 2 – Grade 4, Term 1	Grade 3
18–21	Grade 4, Term 2 – Grade 5, Term 1	Grade 4
22–25	Grade 5, Term 2 – Grade 6, Term 1	Grade 5
26–29	Grade 6, Term 2 – Grade 7, Term 1	Grade 6
30–33	Grade 7, Term 2 – Grade 7, Term 4	Grade 7

Appendix A

Diagnostic Spelling Test – irregular words (DiSTi) Norms Grades 1–4 (www.motif.org.au)

RAW SCORE	GRADE 1		GRADE 2		GRADE 3		GRADE 4	
	Percentile	z-score	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	8	-1.41	0.1	-3.09	1	-2.26	0.1	-3.09
1	12	-1.19	1	-2.23	2	-2.10	0.3	-2.75
2	17	-0.95	3	-1.93	2	-1.98	0.5	-2.58
3	28	-0.59	5	-1.62	4	-1.80	0.7	-2.46
4	40	-0.27	7	-1.50	5	-1.66	0.9	-2.37
5	49	-0.03	11	-1.24	6	-1.55	1	-2.29
6	51	0.03	15	-1.05	8	-1.39	2	-2.17
7	61	0.27	16	-0.99	12	-1.18	2	-2.07
8	65	0.37	17	-0.94	13	-1.12	2	-2.00
9	66	0.41	19	-0.89	16	-1.02	3	-1.90
10	67	0.44	20	-0.84	16	-0.99	3	-1.83
11	72	0.59	23	-0.75	17	-0.97	5	-1.69
12	74	0.63	27	-0.62	19	-0.88	6	-1.58
13	75	0.67	32	-0.47	20	-0.83	7	-1.49
14	78	0.76	35	-0.39	21	-0.79	8	-1.41
15	79	0.80	41	-0.22	24	-0.71	9	-1.33
16	83	0.95	45	-0.12	25	-0.67	10	-1.31
17	84	0.98	49	-0.02	29	-0.57	10	-1.29
18	84	1.00	52	0.05	32	-0.46	10	-1.26
19	87	1.12	59	0.22	35	-0.40	12	-1.20
20	88	1.19	61	0.29	38	-0.30	14	-1.09
21	92	1.41	67	0.43	39	-0.27	14	-1.06
22	92	1.43	68	0.47	43	-0.18	15	-1.04
23	93	1.46	71	0.54	46	-0.09	16	-0.99
24	93	1.48	75	0.67	50	0.00	18	-0.90
25	93	1.51	77	0.75	52	0.06	22	-0.78
26	94	1.53	81	0.89	56	0.15	23	-0.74
27	94	1.55	83	0.94	57	0.18	24	-0.70
28	94	1.57	84	0.99	62	0.30	26	-0.63
29	94	1.59	85	1.05	64	0.37	28	-0.59
30	95	1.62	87	1.11	67	0.43	31	-0.50
31	96	1.76	87	1.12	70	0.53	35	-0.40
32	96	1.79	87	1.13	73	0.60	40	-0.25
33	97	1.82	87	1.14	74	0.64	43	-0.19
34	97	1.85	88	1.15	76	0.71	46	-0.10
35	97	1.88	88	1.16	77	0.75	47	-0.07
36	97	1.91	88	1.17	80	0.83	48	-0.06
37	97	1.94	91	1.32	81	0.88	48	-0.04
38	99	2.23	93	1.45	82	0.92	52	0.04
39	99	2.48	95	1.62	86	1.07	53	0.09
40	>99	>2.48	95	1.66	88	1.18	55	0.13
41	>99	>2.48	96	1.70	89	1.24	56	0.16
42	>99	>2.48	96	1.75	91	1.31	57	0.17
43	>99	>2.48	96	1.80	92	1.39	57	0.18
44	>99	>2.48	97	1.86	92	1.43	58	0.19
45	>99	>2.48	97	1.93	93	1.47	58	0.20
46	>99	>2.48	98	2.02	93	1.49	59	0.22
47	>99	>2.48	98	2.14	93	1.51	63	0.34
48	>99	>2.48	99	2.30	94	1.53	67	0.43
49	>99	>2.48	99	2.55	94	1.55	68	0.46
50	>99	>2.48	>99	>2.55	96	1.80	69	0.49
51	>99	>2.48	>99	>2.55	97	1.83	70	0.53
52	>99	>2.48	>99	>2.55	97	1.86	71	0.56
53	>99	>2.48	>99	>2.55	97	1.90	74	0.63
54	>99	>2.48	>99	>2.55	97	1.94	76	0.70
55	>99	>2.48	>99	>2.55	98	1.98	79	0.82
56	>99	>2.48	>99	>2.55	99	2.26	84	0.99
57	>99	>2.48	>99	>2.55	99	2.41	85	1.04
58	>99	>2.48	>99	>2.55	>99	2.65	86	1.09
59	>99	>2.48	>99	>2.55	>99	>2.65	87	1.15
60	>99	>2.48	>99	>2.55	>99	>2.65	91	1.33
61	>99	>2.48	>99	>2.55	>99	>2.65	94	1.58
62	>99	>2.48	>99	>2.55	>99	>2.65	95	1.68
63	>99	>2.48	>99	>2.55	>99	>2.65	97	1.83
64	>99	>2.48	>99	>2.55	>99	>2.65	97	1.88
65	>99	>2.48	>99	>2.55	>99	>2.65	97	1.93
66	>99	>2.48	>99	>2.55	>99	>2.65	98	2.00
67	>99	>2.48	>99	>2.55	>99	>2.65	99	2.29
68	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
69	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
70	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
71	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
72	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
73	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29
74	>99	>2.48	>99	>2.55	>99	>2.65	>99	>2.29

Appendix B

Diagnostic Spelling Test – irregular words (DiSTi) Norms Grades 5–7 (www.motif.org.au)

RAW SCORE	GRADE 5		GRADE 6		GRADE 7	
	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	0.1	-3.09	0.1	-3.09	0.1	-3.09
1	0.4	-2.65	0.3	-2.75	0.2	-2.93
2	0.7	-2.46	0.5	-2.58	0.2	-2.82
3	1	-2.33	0.7	-2.46	0.3	-2.74
4	1	-2.27	0.9	-2.37	0.4	-2.67
5	1	-2.22	1	-2.29	0.5	-2.61
6	1	-2.18	2	-2.01	0.5	-2.56
7	2	-2.14	2	-1.97	0.6	-2.52
8	2	-2.10	3	-1.93	0.7	-2.48
9	2	-2.07	3	-1.89	0.7	-2.44
10	2	-2.03	3	-1.85	0.8	-2.41
11	2	-1.99	3	-1.82	0.9	-2.37
12	3	-1.94	4	-1.79	1	-2.33
13	3	-1.90	4	-1.77	1	-2.29
14	3	-1.87	4	-1.74	1	-2.26
15	4	-1.73	4	-1.72	1	-2.23
16	5	-1.63	5	-1.61	1	-2.20
17	8	-1.39	7	-1.51	2	-2.17
18	9	-1.32	7	-1.48	2	-2.07
19	11	-1.23	8	-1.44	2	-2.00
20	13	-1.15	10	-1.30	3	-1.93
21	14	-1.10	10	-1.28	3	-1.87
22	16	-1.01	10	-1.26	3	-1.85
23	18	-0.93	11	-1.24	3	-1.83
24	21	-0.81	12	-1.19	3	-1.82
25	22	-0.78	15	-1.03	4	-1.80
26	24	-0.71	16	-0.99	4	-1.79
27	26	-0.64	17	-0.95	4	-1.77
28	28	-0.58	18	-0.90	5	-1.68
29	32	-0.46	19	-0.86	5	-1.65
30	33	-0.43	20	-0.83	5	-1.62
31	34	-0.40	24	-0.72	6	-1.55
32	35	-0.39	24	-0.69	7	-1.48
33	35	-0.37	25	-0.67	8	-1.43
34	37	-0.35	26	-0.65	10	-1.29
35	38	-0.32	30	-0.52	12	-1.17
36	39	-0.29	33	-0.43	13	-1.15
37	39	-0.28	36	-0.37	13	-1.13
38	40	-0.26	38	-0.32	15	-1.02
39	43	-0.18	42	-0.20	16	-0.99
40	44	-0.16	43	-0.18	17	-0.96
41	45	-0.13	45	-0.12	19	-0.87
42	46	-0.11	47	-0.07	21	-0.82
43	48	-0.05	48	-0.04	21	-0.79
44	49	-0.03	50	0.00	24	-0.69
45	53	0.08	52	0.04	25	-0.67
46	56	0.16	53	0.07	28	-0.60
47	58	0.21	56	0.15	32	-0.46
48	60	0.26	56	0.16	33	-0.45
49	63	0.32	57	0.18	36	-0.36
50	65	0.37	58	0.20	37	-0.32
51	68	0.46	59	0.23	40	-0.26
52	70	0.52	60	0.26	43	-0.18
53	72	0.58	61	0.29	48	-0.05
54	75	0.67	65	0.37	50	0.01
55	78	0.78	67	0.43	52	0.05
56	82	0.93	70	0.52	56	0.14
57	85	1.05	72	0.58	60	0.24
58	88	1.15	76	0.72	60	0.26
59	89	1.20	82	0.90	65	0.38
60	91	1.32	85	1.03	71	0.55
61	91	1.33	86	1.08	75	0.67
62	91	1.35	89	1.24	77	0.74
63	91	1.37	93	1.44	82	0.93
64	92	1.39	95	1.61	86	1.09
65	96	1.73	95	1.64	88	1.17
66	97	1.87	95	1.68	90	1.29
67	98	2.16	96	1.72	92	1.38
68	>99	>2.16	98	2.01	96	1.77
69	>99	>2.16	99	2.29	97	1.88
70	>99	>2.16	>99	>2.29	98	2.00
71	>99	>2.16	>99	>2.29	99	2.17
72	>99	>2.16	>99	>2.29	99	2.43
73	>99	>2.16	>99	>2.29	>99	>2.43
74	>99	>2.16	>99	>2.29	>99	>2.43

Appendix C

Diagnostic Spelling Test – nonwords (DiSTn) Norms Without Stopping Rule Grades 1–4
 (www.motif.org.au)

RAW SCORE	GRADE 1		GRADE 2		GRADE 3		GRADE 4	
	Percentile	z-score	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	0.1	-3.09	0.1	-3.09	0.1	-3.09	0.1	-3.09
1	0.4	-2.69	0.2	-2.83	0.6	-2.54	0.2	-2.88
2	0.6	-2.50	0.4	-2.68	1	-2.32	0.3	-2.75
3	0.9	-2.37	0.5	-2.58	1	-2.18	0.4	-2.65
4	1	-2.28	0.6	-2.49	2	-2.07	0.5	-2.58
5	1	-2.20	0.8	-2.42	2	-1.98	0.6	-2.51
6	4	-1.72	0.9	-2.37	3	-1.91	0.7	-2.46
7	7	-1.46	1	-2.31	3	-1.84	0.8	-2.41
8	9	-1.36	1	-2.27	4	-1.79	0.9	-2.37
9	12	-1.20	1	-2.23	5	-1.65	1	-2.33
10	17	-0.94	3	-1.95	6	-1.55	1	-2.29
11	20	-0.83	4	-1.77	7	-1.50	2	-2.00
12	22	-0.76	5	-1.64	7	-1.45	3	-1.96
13	25	-0.69	6	-1.52	9	-1.37	3	-1.92
14	29	-0.55	8	-1.43	9	-1.34	3	-1.89
15	31	-0.49	9	-1.34	9	-1.32	3	-1.85
16	33	-0.43	13	-1.14	10	-1.29	3	-1.83
17	35	-0.39	15	-1.02	11	-1.23	4	-1.79
18	44	-0.16	16	-0.99	11	-1.21	4	-1.76
19	46	-0.09	17	-0.97	12	-1.19	4	-1.74
20	47	-0.07	17	-0.95	12	-1.17	4	-1.71
21	48	-0.06	18	-0.93	15	-1.05	5	-1.68
22	49	-0.04	18	-0.92	16	-1.00	6	-1.58
23	49	-0.02	22	-0.78	17	-0.95	8	-1.41
24	51	0.02	26	-0.66	20	-0.86	9	-1.33
25	55	0.13	28	-0.58	21	-0.79	12	-1.20
26	59	0.24	30	-0.54	23	-0.73	12	-1.17
27	64	0.35	35	-0.40	26	-0.66	13	-1.15
28	64	0.36	37	-0.33	26	-0.64	14	-1.09
29	65	0.37	40	-0.26	27	-0.62	14	-1.06
30	65	0.38	42	-0.19	29	-0.54	15	-1.04
31	65	0.39	45	-0.13	34	-0.41	16	-0.99
32	67	0.43	47	-0.07	35	-0.37	16	-0.98
33	68	0.47	49	-0.03	37	-0.34	17	-0.97
34	71	0.55	50	0.00	39	-0.28	17	-0.96
35	73	0.60	54	0.10	42	-0.21	17	-0.95
36	75	0.69	56	0.16	44	-0.15	20	-0.86
37	77	0.73	60	0.26	46	-0.09	20	-0.84
38	78	0.78	63	0.33	50	0.00	21	-0.82
39	80	0.86	64	0.36	55	0.12	21	-0.80
40	83	0.94	67	0.43	60	0.25	22	-0.78
41	84	1.00	68	0.46	61	0.28	28	-0.59
42	86	1.06	74	0.66	62	0.31	33	-0.43
43	88	1.16	78	0.78	67	0.44	34	-0.40
44	90	1.28	80	0.82	71	0.54	36	-0.37
45	92	1.41	81	0.87	73	0.62	39	-0.28
46	94	1.57	81	0.89	77	0.73	46	-0.10
47	97	1.90	82	0.90	79	0.82	51	0.02
48	97	1.92	82	0.92	82	0.90	53	0.07
49	97	1.94	86	1.08	84	1.00	55	0.13
50	98	1.97	86	1.10	87	1.11	61	0.28
51	98	2.00	87	1.12	88	1.17	63	0.34
52	98	2.02	87	1.15	92	1.37	67	0.43
53	98	2.05	88	1.17	93	1.45	74	0.63
54	98	2.09	89	1.20	94	1.55	78	0.78
55	98	2.12	92	1.43	95	1.65	83	0.95
56	98	2.16	94	1.52	96	1.70	87	1.15
57	99	2.20	96	1.77	96	1.74	90	1.26
58	99	2.28	97	1.83	96	1.79	92	1.41
59	99	2.39	97	1.88	98	1.98	93	1.48
60	99	2.54	97	1.94	98	2.10	94	1.58
61	>99	2.77	99	2.23	99	2.26	96	1.75
62	>99	>2.77	99	2.38	99	2.37	98	2.00
63	>99	>2.77	>99	2.62	99	2.51	99	2.29
64	>99	>2.77	>99	>2.62	>99	2.75	>99	>2.29
65	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
66	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
67	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
68	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
69	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
70	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
71	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
72	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
73	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29
74	>99	>2.77	>99	>2.62	>99	>2.75	>99	>2.29

Appendix D

Diagnostic Spelling Test – nonwords (DiSTn) Norms Without Stopping Rule Grades 5–7

RAW SCORE	GRADE 5		GRADE 6		GRADE 7	
	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	1	-2.29	0.1	-3.09	0.1	-3.09
1	1	-2.25	0.2	-2.86	0.2	-2.92
2	1	-2.22	0.3	-2.72	0.3	-2.80
3	1	-2.19	0.4	-2.62	0.3	-2.71
4	2	-2.16	0.5	-2.55	0.4	-2.64
5	2	-2.13	0.7	-2.48	0.5	-2.58
6	2	-2.10	0.8	-2.42	1	-2.53
7	2	-2.08	0.9	-2.37	1	-2.49
8	2	-2.06	1	-2.33	1	-2.45
9	2	-2.03	1	-2.29	1	-2.41
10	2	-1.99	2	-2.01	1	-2.30
11	3	-1.95	3	-1.93	1	-2.22
12	3	-1.92	3	-1.85	2	-2.14
13	3	-1.88	4	-1.72	2	-2.12
14	3	-1.85	5	-1.68	2	-2.10
15	4	-1.73	5	-1.64	2	-2.08
16	5	-1.67	5	-1.61	2	-2.06
17	5	-1.62	7	-1.51	2	-2.05
18	7	-1.45	7	-1.47	2	-2.03
19	8	-1.41	8	-1.44	2	-2.01
20	8	-1.38	8	-1.40	2	-2.00
21	9	-1.34	9	-1.37	3	-1.93
22	10	-1.31	10	-1.30	3	-1.87
23	10	-1.28	11	-1.24	4	-1.76
24	11	-1.25	12	-1.19	5	-1.67
25	11	-1.23	13	-1.15	5	-1.65
26	11	-1.21	13	-1.11	5	-1.63
27	12	-1.20	14	-1.08	5	-1.61
28	14	-1.09	15	-1.03	6	-1.54
29	16	-1.00	16	-0.99	7	-1.48
30	17	-0.96	17	-0.97	10	-1.28
31	19	-0.88	17	-0.95	12	-1.20
32	21	-0.80	18	-0.93	12	-1.16
33	22	-0.77	18	-0.92	13	-1.12
34	23	-0.73	18	-0.90	14	-1.08
35	28	-0.57	23	-0.75	15	-1.05
36	30	-0.54	24	-0.72	16	-0.98
37	32	-0.48	26	-0.65	18	-0.92
38	33	-0.45	27	-0.62	20	-0.83
39	34	-0.42	29	-0.55	21	-0.81
40	36	-0.36	30	-0.52	24	-0.71
41	39	-0.28	32	-0.46	28	-0.59
42	40	-0.25	36	-0.37	33	-0.43
43	43	-0.17	38	-0.32	40	-0.27
44	46	-0.09	45	-0.12	46	-0.11
45	47	-0.07	48	-0.04	49	-0.03
46	48	-0.04	52	0.04	54	0.11
47	52	0.04	54	0.10	61	0.27
48	57	0.17	56	0.15	63	0.33
49	61	0.28	60	0.26	69	0.50
50	65	0.39	70	0.52	73	0.61
51	71	0.54	72	0.58	76	0.71
52	74	0.63	74	0.65	83	0.95
53	80	0.84	76	0.72	85	1.05
54	81	0.88	80	0.83	89	1.23
55	82	0.92	83	0.95	93	1.48
56	85	1.05	85	1.03	94	1.54
57	86	1.09	87	1.13	96	1.76
58	90	1.25	89	1.24	98	2.00
59	92	1.38	94	1.51	98	2.03
60	94	1.53	95	1.61	98	2.06
61	95	1.62	96	1.72	98	2.10
62	96	1.73	97	1.85	98	2.14
63	98	2.03	98	2.02	99	2.41
64	99	2.29	99	2.29	>99	>2.41
65	99	2.44	99	2.40	>99	>2.41
66	>99	2.68	99	2.54	>99	>2.41
67	>99	>2.68	>99	2.78	>99	>2.41
68	>99	>2.68	>99	>2.78	>99	>2.41
69	>99	>2.68	>99	>2.78	>99	>2.41
70	>99	>2.68	>99	>2.78	>99	>2.41
71	>99	>2.68	>99	>2.78	>99	>2.41
72	>99	>2.68	>99	>2.78	>99	>2.41
73	>99	>2.68	>99	>2.78	>99	>2.41
74	>99	>2.68	>99	>2.78	>99	>2.41

Appendix E

Diagnostic Spelling Test – nonwords (DiSTn) Norms with Stopping Rule Grades 1–4

RAW SCORE	GRADE 1		GRADE 2		GRADE 3		GRADE 4	
	Percentile	z-score	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	3	-1.90	0.1	-3.09	4	-1.79	0.1	-3.09
1	3	-1.83	1	-2.23	6	-1.55	1	-2.29
2	4	-1.77	2	-2.10	7	-1.51	2	-2.00
3	4	-1.72	2	-2.00	7	-1.48	3	-1.95
4	7	-1.51	3	-1.91	7	-1.45	3	-1.90
5	9	-1.36	3	-1.84	9	-1.37	3	-1.86
6	15	-1.06	4	-1.77	9	-1.33	3	-1.83
7	16	-1.00	5	-1.64	10	-1.29	6	-1.58
8	26	-0.64	6	-1.52	12	-1.20	6	-1.53
9	35	-0.39	13	-1.14	13	-1.11	7	-1.48
10	45	-0.13	22	-0.78	16	-1.00	9	-1.37
11	46	-0.09	30	-0.54	20	-0.86	10	-1.26
12	49	-0.02	32	-0.46	21	-0.82	12	-1.20
13	57	0.16	37	-0.33	28	-0.58	14	-1.09
14	58	0.20	39	-0.29	33	-0.44	15	-1.04
15	59	0.24	42	-0.19	37	-0.34	17	-0.95
16	65	0.39	44	-0.16	40	-0.25	23	-0.74
17	73	0.60	49	-0.03	43	-0.18	24	-0.70
18	74	0.64	55	0.13	45	-0.12	28	-0.59
19	75	0.69	58	0.19	46	-0.09	28	-0.58
20	76	0.70	59	0.23	48	-0.06	29	-0.56
21	76	0.71	62	0.29	49	-0.03	31	-0.50
22	76	0.72	67	0.43	52	0.06	33	-0.43
23	77	0.73	68	0.47	55	0.12	36	-0.37
24	80	0.83	69	0.50	57	0.18	39	-0.28
25	81	0.89	71	0.54	58	0.19	43	-0.19
26	84	1.00	71	0.55	58	0.20	43	-0.18
27	87	1.13	71	0.56	58	0.21	43	-0.17
28	88	1.16	72	0.58	59	0.21	44	-0.16
29	88	1.20	72	0.58	59	0.22	44	-0.15
30	89	1.23	72	0.59	59	0.23	44	-0.15
31	90	1.28	72	0.60	60	0.24	44	-0.14
32	90	1.30	73	0.60	60	0.25	44	-0.14
33	91	1.32	73	0.61	60	0.26	45	-0.14
34	91	1.34	73	0.62	61	0.27	45	-0.13
35	91	1.36	74	0.63	61	0.28	45	-0.12
36	92	1.37	74	0.65	62	0.31	46	-0.10
37	92	1.39	75	0.67	66	0.41	46	-0.09
38	92	1.40	76	0.69	68	0.48	46	-0.09
39	92	1.42	77	0.74	71	0.54	47	-0.08
40	92	1.43	78	0.76	73	0.62	47	-0.08
41	93	1.45	79	0.79	74	0.66	47	-0.07
42	93	1.46	80	0.82	76	0.69	48	-0.04
43	94	1.51	81	0.87	77	0.73	49	-0.01
44	94	1.57	82	0.92	79	0.82	51	0.01
45	96	1.71	83	0.94	83	0.95	52	0.04
46	97	1.90	83	0.97	84	1.00	58	0.19
47	97	1.92	84	0.99	87	1.11	62	0.31
48	97	1.94	85	1.02	89	1.23	64	0.37
49	98	1.96	87	1.14	90	1.29	67	0.43
50	98	1.99	88	1.16	93	1.45	70	0.53
51	98	2.01	88	1.19	94	1.55	72	0.59
52	98	2.04	89	1.21	96	1.79	75	0.67
53	98	2.07	89	1.24	97	1.84	79	0.82
54	98	2.09	90	1.26	97	1.91	82	0.90
55	98	2.13	94	1.52	98	1.98	86	1.09
56	98	2.16	95	1.64	98	2.05	90	1.26
57	99	2.20	96	1.77	98	2.14	92	1.41
58	99	2.28	97	1.83	99	2.26	93	1.48
59	99	2.39	97	1.88	99	2.32	94	1.58
60	99	2.54	97	1.94	99	2.38	95	1.69
61	>99	2.77	99	2.23	99	2.46	97	1.82
62	>99	>2.77	99	2.38	99	2.57	98	2.00
63	>99	>2.77	>99	2.62	>99	2.70	99	2.29
64	>99	>2.77	>99	>2.62	>99	2.93	>99	>2.29
65	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
66	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
67	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
68	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
69	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
70	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
71	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
72	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
73	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29
74	>99	>2.77	>99	>2.62	>99	>2.93	>99	>2.29

Appendix F

Diagnostic Spelling Test – nonwords (DiSTn) Norms with Stopping Rule Grades 5–7

RAW SCORE	GRADE 5		GRADE 6		GRADE 7	
	Percentile	z-score	Percentile	z-score	Percentile	z-score
0	2	-2.03	0.1	-3.09	0.1	-3.09
1	2	-1.98	4	-1.72	0.2	-2.88
2	3	-1.93	5	-1.69	0.3	-2.75
3	3	-1.88	5	-1.67	0.4	-2.65
4	3	-1.84	5	-1.65	0.5	-2.58
5	4	-1.80	5	-1.63	0.6	-2.51
6	4	-1.76	5	-1.61	0.7	-2.46
7	4	-1.73	9	-1.37	0.8	-2.41
8	6	-1.53	10	-1.30	2	-2.14
9	8	-1.38	11	-1.24	2	-2.06
10	10	-1.31	12	-1.18	2	-2.00
11	12	-1.20	13	-1.13	3	-1.87
12	17	-0.96	15	-1.03	4	-1.76
13	21	-0.80	17	-0.95	6	-1.54
14	23	-0.73	20	-0.83	7	-1.48
15	24	-0.72	25	-0.68	12	-1.20
16	24	-0.70	25	-0.67	17	-0.95
17	27	-0.60	26	-0.65	19	-0.86
18	28	-0.57	28	-0.58	21	-0.81
19	30	-0.54	31	-0.49	24	-0.71
20	31	-0.51	32	-0.47	27	-0.61
21	35	-0.39	32	-0.46	32	-0.47
22	36	-0.36	33	-0.43	33	-0.43
23	37	-0.34	34	-0.40	36	-0.37
24	39	-0.28	36	-0.37	36	-0.35
25	40	-0.25	37	-0.34	37	-0.33
26	41	-0.22	38	-0.31	38	-0.31
27	42	-0.20	39	-0.29	40	-0.27
28	43	-0.19	39	-0.28	40	-0.25
29	43	-0.17	39	-0.28	42	-0.20
30	44	-0.16	39	-0.27	42	-0.20
31	44	-0.14	39	-0.27	42	-0.19
32	45	-0.13	39	-0.27	43	-0.19
33	45	-0.12	40	-0.26	43	-0.17
34	46	-0.11	40	-0.26	44	-0.16
35	46	-0.09	41	-0.23	44	-0.15
36	47	-0.07	42	-0.20	45	-0.14
37	48	-0.04	43	-0.18	45	-0.13
38	49	-0.03	44	-0.16	47	-0.09
39	50	-0.01	44	-0.14	48	-0.05
40	51	0.01	45	-0.12	49	-0.03
41	51	0.03	46	-0.10	50	-0.01
42	52	0.04	47	-0.07	54	0.11
43	53	0.07	48	-0.04	57	0.19
44	54	0.09	55	0.12	61	0.27
45	56	0.15	55	0.13	64	0.35
46	59	0.22	56	0.15	67	0.45
47	60	0.25	58	0.20	69	0.50
48	63	0.34	60	0.26	72	0.59
49	65	0.39	65	0.37	77	0.73
50	70	0.51	72	0.58	80	0.83
51	74	0.63	73	0.62	81	0.86
52	77	0.73	75	0.68	86	1.08
53	82	0.92	76	0.72	88	1.16
54	83	0.94	80	0.83	91	1.32
55	83	0.96	83	0.95	95	1.61
56	85	1.05	85	1.03	95	1.67
57	86	1.09	87	1.13	96	1.76
58	90	1.25	89	1.24	98	2.00
59	92	1.38	94	1.51	98	2.03
60	94	1.53	95	1.61	98	2.06
61	95	1.62	96	1.72	98	2.10
62	96	1.73	97	1.85	98	2.14
63	98	2.03	98	2.02	99	2.41
64	99	2.29	99	2.29	>99	>2.41
65	99	2.44	99	2.40	>99	>2.41
66	>99	2.68	99	2.54	>99	>2.41
67	>99	>2.68	>99	2.78	>99	>2.41
68	>99	>2.68	>99	>2.78	>99	>2.41
69	>99	>2.68	>99	>2.78	>99	>2.41
70	>99	>2.68	>99	>2.78	>99	>2.41
71	>99	>2.68	>99	>2.78	>99	>2.41
72	>99	>2.68	>99	>2.78	>99	>2.41
73	>99	>2.68	>99	>2.78	>99	>2.41
74	>99	>2.68	>99	>2.78	>99	>2.41

Appendix G

Diagnostic Spelling Test – nonwords (DiSTn) Instructions

The tester should ensure they are familiar with the nonwords and their pronunciations. It is strongly recommended that the tester looks up “similar sounding words” or listens to recordings of the nonword pronunciations, both available from the first author or the MOTif website (www.motif.org.au). Score and answer sheets are also available from this website.

This test can be administered in a group situation or in a one-on-one situation. Only the answer sheet and a pen or pencil should be on a student’s desk.

All students should complete the entire test, except in cases where a child has little or no knowledge of sound letter rules (see “Discontinue Rule” below). While it is preferable to administer the test in a single session, the test can be administered in two shorter sessions if necessary. Please note, however, that the norms were collected in one testing session.

For group administration: Make sure that the seating is arranged such that students cannot easily see anyone else’s work. The students should not talk, look at anyone else’s work or try to help one another.

Discontinue rule

This test does not have a compulsory stopping rule. This is because a response to every item is required in order to complete the error analysis and identify which sound letter rules a child knows. However, in cases where it is clear that a child has little or no knowledge of letter sound rules, a discontinue rule may be applied in order to avoid frustration. In such cases, the test may be discontinued after five consecutive errors. Separate norms apply in cases when the discontinue rule is applied.

Administration

Say the following:

1. Write down your first name and your family name on your response sheet.
2. Write down your date of birth (or age if more appropriate).
3. Write down the date. The date today is the _____ (say date).
4. Turn the sheet over.

5. I am going to give you a test and I want to see how well you can do. Please try to do your best and write as neatly as you can. If you are not sure what the correct answer is, I still want you to try your best.
6. For group administration: Please do not talk or look at anyone else's work or let anyone else see your work.
7. Your response sheet is numbered from 1 to 74. I am going to say 74 nonwords. Nonwords are made up words that do not exist. But you can spell them anyway. Sometimes more than one answer is correct. Only write down one answer.

I will say a nonword. If you did not hear it, listen very carefully because I will say the nonword one more time. Then write down your answer. If you really did not hear the nonword put up your hand and wait for me to ask you what the problem is.

Unexpected incidents

Repetition of items: If a student does not hear an item, the test administrator needs to make a judgement whether or not to repeat the word, bearing in mind that too much repetition might be disruptive to the testing situation. Initially, the administrator may want to remind the student/s to listen carefully since items will not be repeated after the initial presentation.

Administration speed: If requests for repetitions occur frequently, the administration speed may be too high. If students have too much time between test items, speed should be increased.

Ability groups: It may be useful to divide students into smaller groups that are matched on ability as the students with weaker spelling skills may require more time, while administration speed should be higher for advanced students.

Appendix H

Diagnostic Spelling Test – nonwords (DiSTn) Scoring Sheet (www.motif.org.au)

No	Pronunciation (IPA)	Item	Other acceptable responses	Response	Circle as appropriate			Accuracy (Whole Item)
					Initial PGC	Medial PGC	Final PGC	
1	mɪp	mip			m	i	p	
2	næm	nam	knam, knamb, namb		n, kn	a	m, mb	
3	hɛg	heg			h	e	g	
4	bʊv	buv	buve, bove		b	u/o-e	v/ve	
5	gɪb	gib			g	i	b	
6	hʌd	hud			h	u	d	
7	fɒt	fot			f	o	t	
8	dæp	dap			d	a	p	
9	tɛm	tem	temb		t	e	m/mb	
10	dʒæv	jav	jave		j	a	v/ve	
11	sʌg	sug			s	u	g	
12	lɒnt	lont			l	o	n t	
13	pɒnk	ponk			p	o	n k	
14	li:t	leet	leat, lete		l	ee/ea/e-e	t	
15	θɒb	thob			th	o	b	
16	ni:g	neeg	neag, kneeg, kneag*		kn/n	ee/ea/e-e	g	
17	ku:v	koov	coov, coove, koove, cuve, kuve		c/k	oo/u-e	v/ve	
18	si:b	seeb	seab, sebe, cebe, ceab, ceeb		s/c	ea/ee/e-e	b	
19	zɔ:m	zorm	zawm, zaum		z	or/aw/au	m	
20	kwi:d	queed	quead, quede		qu	ea/ee/e-e	d	
21	wu:st	woost	whoosed, whoost, woosed		w/wh	oo	s t/s ed	
22	rɪz	rizz	riz, wriz, wrizz		r/wr	i	zz/z	
23	ju:m	yoom	ume, yume, youm		y	oo/u-e/ou	m	
24	lɛŋ	leng			l	e	ng	
25	væk	vack			v	a	ck	
26	dɑ:p	darp			d	ar	p	
27	ʃʌs	shuss			sh	u	ss	
28	θɪf	thiff			th	i	ff	
29	jek	yeck			y	e	ck	
30	zel	zell			z	e	ll	
31	ja:ʃ	yarsh			y	ar	sh	
32	kwu:tʃ	quooch			qu	oo	ch	
33	pa:f	parf			p	ar	f	
34	lɜ:θ	lurth	lirth, lerth		l	ur/ir/er	th	
35	jɔ:tʃ	yorch	yawch, yauch, yourch		y	or/aw/au/o ur	ch	
36	zai	zie	zy		z		ie/y	
37	kwɔɪk	quoik			qu	oi	k	
38	snei	snay			s n		ay	
39	ʃaɪf	shife			sh	i-e	f	
40	blɔɪ	bloy			b l		oy	
41	wæŋ	wang	whang		w/wh	a	ng	
42	tʃeɪt	chate	chait		ch	a-e/ai	t	
43	θɜ:k	therk	thirk, thurk		th	ir/er/ur	k	
44	rəʊf	rofe	roaf, wrofe, wroaf		r	o-e/oa	f	
45	geɪd	gade	gaid, gayed+		g	ai/a-e/ay	d/ed	
46	dɔɪ	droy			d r		oy	
47	hɔɪlt	hoilt	hoiled		h	oi	l t/l ed	
48	zɜ:n	zirn	zurn, zern		z	er/ir/ur	n	
49	dʒɔ:t	jort	jawt, jaut		j	or/aw/au	t	
50	teɪ	tay			t		ey/ay	

51	ḏsɜ:b	jerb	gerb, jirb, girb, jurb		j/g	er/ir/ur	b		
52	tʃeɪ	chay			ch		ey/ay		
53	traʊd	trode	troad		t r	oa/ow	d		
54	glai	gly	glie		g l		y/ie		
55	ḏɔ:ʃ	thorsh	thawsh, thaush		th	or/aw/au	sh		
56	kwaɪv	quive			qu	i-e	v		
57	veɪ	vay			v		ay		
58	raʊʃ	roush	wroush		r	ou	sh		
59	ʃlai	shly	shlie		sh l		ie/y		
60	heɪf	hafe	haif		h	a-e/ai	f		
61	ka:ʤ	carge	karge		c/k	ar	ge		
62	ḏʤais	jise	jice, gise, gice		j/g	i-e	s/ce		
63	lɔɪ	loy			l		oy		
64	waʊl	whoul	woul, wowl, howl		w/wh	ou/ow	l		
65	trɪŋ	tring			t r	i	ng		
66	ḏɔɪ	thoy			th		oy		
67	wəʊp	woup	whoup, wowp, whowp		w/wh	ou/ow	p		
68	vəʊm	vome	voam		v	oa/o-e	m		
69	ḏɔɪŋ	thoing			th	oi	ng		
70	zəʊʤ	zoge	zoage		z	oa/o-e	ge		
71	məʊg	moug			m	ou	g		
72	flaɪθ	flaith			f l	ai	th		
73	θraɪp	thripe			th r	i-e	p		
74	zɔɪʃ	zoish			z	oi	sh		
								Sum Correct	

* Note: Nege is incorrect

+ Note: Gayd is incorrect

Appendix I

Diagnostic Spelling Test – irregular words (DiSTi) Instructions

Familiarise yourself with the words and sentences.

This test can be administered in a group situation or in a one-on-one situation. Only the answer sheet and a pen or pencil should be on a student's desk.

For group administration: Make sure that the seating is arranged such that students cannot easily see each other's work. The students should not talk, look at anyone else's work or try to help one another.

Discontinue Rule

Stop testing after five consecutive incorrect responses. During group testing, it may be difficult to see whether or not a child has made five consecutive incorrect responses. In such cases, do not score any responses made after the limit of five consecutive incorrect responses has been reached.

Administration

Say the following:

1. Write down your first name and your family name on your response sheet.
2. Write down your date of birth (or age if more appropriate).
3. Write down the date. The date today is the _____ (say date)
4. Turn the sheet over.
5. I am going to give you a test and I want to see how well you can do. Please try to do your best and write as neatly as you can. If you are not sure what the correct answer is, I still want you to try your best.
6. For group administration: Please do not talk or look at anyone else's work or let anyone else see your work.
7. Your response sheet is numbered from 1 to 74. I am going to say 74 words. I will say the word. Then a sentence with the word in it. I will then say the word again. Then write down your answer. If you really did not hear the word, put up your hand and wait for me to ask you what the problem is.

Unexpected incidents

Repetition of items: If a student does not hear an item, the test administrator needs to make a judgement whether or not to repeat the word, bearing in mind that too much repetition might be disruptive to the testing situation. Initially, the administrator may want to remind the student/s to listen carefully since items will not be repeated after the initial presentation.

Administration speed: If requests for repetitions occur frequently, the administration speed may be too high. If students have too much time between test items, the speed should be increased.

Ability groups: It may be useful to divide students into smaller groups that are matched on ability as the poorer students may require more time, while administration speed should be higher for advanced students.

Appendix J

Diagnostic Spelling Test – irregular words (DiSTi) Scoring Sheet (www.motif.org.au)

No	Word	Sentence	Response	Score
1	good	Izzv is a good surfer. Good		
2	was	The boy was home. Was.		
3	have	I have a sister. Have.		
4	school	The school had 800 students. School.		
5	come	Come with me. Come.		
6	ball	Pass the ball. Ball		
7	said	She said yes. Said.		
8	work	My mother goes to work in the morning. Work.		
9	lion	The lion lives in Africa. Lion.		
10	what	What did you say? What.		
11	people	Many people came to the play. People.		
12	mouse	The cat chased the mouse. Mouse.		
13	walk	You walk very fast. Walk.		
14	were	They were happy. Were.		
15	friend	She is a good friend. Friend.		
16	because	She won the race because she is fast. Because.		
17	should	I should stay home. Should.		
18	please	Please pass me the salt. Please.		
19	giant	The giant had huge feet. Giant		
20	climb	A monkey can climb. Climb.		
21	does	Mark does the washing up. Does.		
22	breakfast	She has cereal for breakfast. Breakfast.		
23	country	Australia is a country. Country.		
24	laugh	I laugh at the joke. Laugh.		
25	heart	She has a big heart. Heart.		
26	elephant	The elephant had a long trunk. Elephant.		
27	touch	Don't touch the stove it's hot. Touch.		
28	thought	I thought I knew the boy. Thought.		
29	building	The building is tall. Building.		
30	mountain	Mount Everest is a big mountain. Mountain.		
31	captain	He is the captain of the ship. Captain.		
32	chocolate	Jenny likes chocolate. Chocolate.		
33	daughter	Mary has a daughter. Daughter.		
34	dangerous	Snakes can be dangerous. Dangerous.		
35	carnival	The swimming carnival is on tomorrow. Carnival.		
36	biscuit	The biscuit was yummy. Biscuit.		

(Continued)

Appendix J – continued

No	Word	Sentence	Response	Score
37	creature	The platypus is an interesting creature. Creature.		
38	guest	We are having a guest stay with us. Guest.		
39	penguin	I saw a penguin chase a fish. Penguin.		
40	furious	He was furious. Furious.		
41	measure	I measure the boy's height. Measure.		
42	curious	What a curious dog. Curious.		
43	language	She speaks another language. Language.		
44	dinosaur	A dinosaur must eat a lot. Dinosaur.		
45	ballet	She is a ballet dancer. Ballet.		
46	library	I went to the library. Library.		
47	ancient	The pyramids are ancient. Ancient.		
48	fabulous	What a fabulous day. Fabulous.		
49	delicious	The meal is delicious. Delicious.		
50	jealous	Fran is jealous of her sister. Jealous.		
51	drought	The drought lasted for 7 years. Drought.		
52	failure	The new product was a failure. Failure.		
53	crocodile	The crocodile was 14 foot long. Crocodile.		
54	chemistry	He studies chemistry. Chemistry.		
55	doubt	I don't doubt you. Doubt.		
56	weird	The girl had a weird dream. Weird.		
57	giraffe	A giraffe can run very fast. Giraffe.		
58	yacht	The yacht sailed on the harbour. Yacht.		
59	vague	Her memory was vague. Vague.		
60	astronaut	The astronaut returned to earth. Astronaut.		
61	fortunate	She is fortunate enough to live in a nice house. Fortunate.		
62	tongue	She poked out her tongue. Tongue.		
63	mosquito	The mosquito bit him. Mosquito.		
64	wharf	The boat is at the wharf. Wharf.		
65	ferocious	Tigers can be ferocious. Ferocious.		
66	collapse	He was about to collapse. Collapse.		
67	graffiti	The new graffiti looked great. Graffiti.		
68	sieve	A sieve has holes. Sieve.		
69	turquoise	The water was turquoise. Turquoise.		
70	quiche	She ordered quiche for lunch. Quiche.		
71	diarrhoea	He suffered from bad diarrhoea. Diarrhoea.		
72	miscellaneous	They collected miscellaneous stories. Miscellaneous.		
73	embarrass	Don't embarrass yourself. Embarrass.		
74	mayonnaise	There was mayonnaise on the sandwich. Mayonnaise.		
Sum				