Hidden Reading Difficulties: Identifying children who are Poor Comprehenders

Katrina Kelso, Anne Whitworth, Richard Parsons, Suze Leitao
Curtin University

Corresponding author:
Katrina Kelso M Ed in Applied Linguistics (Honours)
School of Occupational Therapy, Social Work & Speech Pathology
Curtin University
GPO Box U1987, Perth
Western Australia, 6845
Email: katrina.kelso@postgrad.curtin.edu.au

Email addresses for all authors
Anne Whitworth PhD anne.whitworth@curtin.edu.au
Richard Parsons PhD R.Parsons@curtin.edu.au
Suze Leitão PhD S.Leitao@exchange.curtin.edu.au

Acknowledgements
We would like to thank the schools, children and their families, who participated in this study.

Declaration of Conflicting Interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

This paper was accepted for publication in Learning Disability Quarterly on August 18, 2020

Please cite as

Kelso, K., Whitworth, A., Parsons, R., & Leitão, S. (2020). Hidden Reading Difficulties: Identifying Children Who Are Poor Comprehenders. *Learning Disability Quarterly*, pp.1-12.

https://doi.org/10.1177/0731948720961766

Abstract

Poor comprehenders are a significant subgroup of poor readers who, due to their ability to read aloud accurately, are often difficult to identify. This study aimed to determine whether assessment using two oral language tasks, mapped onto the two components of the Simple View of Reading, would provide an efficient approach to identification. Children (N=218) from School Years 3-6 (aged 7;8 – 12;1) attending two schools in Australia were assessed, and 45 identified as potential poor comprehenders, based on a profile of average phonological awareness but poor listening comprehension. Subsequent assessment of decoding and text reading comprehension confirmed 24 of these children to be poor comprehenders, consistent with reported prevalence rates. Five of these children were judged to be weak readers by their classroom teacher. The oral tasks alone over-identified this group, however, the findings suggest that using the tasks as an initial phase, followed up with a reading assessment, could be effective in identifying poor comprehenders, and reduce time spent in testing as this would only involve at-risk children.

Keywords: *poor comprehenders, reading comprehension, identification*

Children with impairments in reading comprehension (often referred to as *poor comprehenders*) 'can read aloud accurately and fluently at a level appropriate for their age but fail to understand much of what they read' (Hulme & Snowling, 2011, p. 139). Gough and his colleagues (Gough & Tunmer, 1986; Hoover & Gough, 1990) proposed the *Simple View of Reading* (SVR) as a way to conceptualise the key components of reading. The proponents of this view postulate that reading comprehension is the product of the complex processes involved in two components: decoding and language comprehension. Decoding is defined as the ability to identify words in print, while language comprehension is defined as the ability to understand spoken language; both are necessary for reading comprehension, while neither

alone is sufficient (Nation, 2019). As the Simple View of Reading sees the development of reading skills as 'parasitic' on oral language skills (Hulme & Snowling, 2014, p.2), and given that poor comprehenders demonstrate strengths in decoding text coupled with weaknesses in reading comprehension, it can be hypothesised that this will be mirrored in the oral domains. Thus, poor comprehenders would show strengths in phonological awareness (which underpin phonological decoding) and weaknesses in oral language/listening comprehension (Hulme & Snowling, 2014).

Since its initial conceptualisation, the SVR has received criticism that it does not take into account other factors that contribute to reading achievement beyond the cognitive domain, such as motivation and home environment (Joshi & Aaron, 2012). Nor does it reflect the changing relationship between reading components across the school years, or the changes in text complexity and task demands experienced by older students (e.g., Catts, 2018; Snow, 2018). Despite these criticisms, the SVR has considerable support among researchers for being both theoretically and empirically motivated, with the components providing a method for classifying poor readers using the two dimensions of decoding and oral language comprehension. Hoover and Gough (1990) found support for the dissociation of the two components, allowing for subgroups with reading comprehension difficulties resulting from either decoding or oral language problems alone (as well as problems with both), highlighting the existence of this group often referred to as poor comprehenders (Bishop & Snowling, 2004; Nation, 2019).

Prevalence of Poor Comprehenders

While early recognition of specific reading comprehension deficits in the presence of advance word recognition had been reported in the literature in groups of children referred to as having *hyperlexia* (e.g., Healy, 1982), it was Oakhill and colleagues who undertook a detailed examination of children selected on the basis of their reading comprehension lagging

behind their decoding ability (see Yuill & Oakhill, 1991). These children were not, reportedly, being identified in classrooms as they did not present with clear clinical indicators of difficulty in the early school years. The first study on poor comprehenders published by Oakhill was in 1982, with the children in this, and subsequent, studies being selected from entire cohorts of children aged 7-8 who were tested to identify those who achieved an average score on a word-to-picture matching vocabulary task. Following this, two criteria were applied: (a) reading accuracy no more than five months below chronological age (CA), and (b) a comprehension age at least six months below accuracy on an early version of the Neale Analysis of Reading Ability (NARA). Using these criteria, 10–15% of all children in Yuill and Oakhill's (1991) samples were identified as being less skilled, or poor, comprehenders. Building on this initial work, Stothard and Hulme (1995), also using the NARA, assessed an unselected group of 147 children aged 7–8, and identified 9.5% as having a poor comprehender profile. (The criteria in this study differed to those of Oakhill with comprehension age required to be at least six months below reading accuracy age and CA, and reading accuracy no more than 12 months below CA). Nation and Snowling (1997) found a similar prevalence of 9.2% amongst a group of 184 children aged 7–9, where listening comprehension (three aurally presented stories with questions) was at least 1.5 *SD* below average nonword reading. The children also performed poorly on the NARA.

More recently, Nation et al. (2010) found a comparable prevalence rate of 8.7% in a group of 172 children at 8 years of age, who had been followed since age 5 (school entry) as part of a longitudinal study. The poor comprehenders in this study were selected using the criteria of a reading accuracy standard score above 90 on the NARA-II (British edition: Neale, 1997), and a reading comprehension score below 90, as well as a minimum discrepancy between the two scores of more than 10 standard score points. Using the same selection criteria as Nation et al. (2010), but different reading measures, Elwer et al. (2015) found a

slightly lower prevalence rate (7.3%) in their retrospective longitudinal study of 772 twins on US grade 4 (aged 9-10) reading measures. Similarly, Clarke et al. (2010) obtained a prevalence of 7.5% in their sample of 1,120 children aged 8-9, who had participated in whole class screening (including listening comprehension, nonverbal IQ and spelling) to select participants for their randomised controlled trial. Elwer et al. (2015) selected their children, referred to as "specific poor reading comprehenders", based on discrepancy between a composite of real and non-word decoding measures, and a composite measure of cloze and multiple-choice answer reading comprehension tasks. Clarke et al.'s (2010) sample was selected based on a 1 *SD* discrepancy between reading accuracy on the Test of Word Reading Efficiency (TOWRE) (Torgesen et al., 1999) and reading comprehension on the NARA-II Form B.

Prevalence figures from the standardisation of the York Assessment of Reading for Comprehension (YARC) primary (Snowling et al., 2009) and secondary (Stothard et al., 2010), taken from a large sample of 1553 children aged 6-16, were 5.3% and 5% respectively (Snowling, 2013). When the criteria for the primary sample were set at a reading comprehension standard score of 90 or below and reading accuracy 90 or above, along with the 1 *SD* discrepancy, 3.3% of the sample were defined as having "clinically significant reading-comprehension difficulties" (Hulme & Snowling, 2011, p. 140).

Catts et al. (2003) found a higher prevalence of 15.4% amongst a group of 183 US grade 2 (aged 7-8) poor readers, however, the participants in this study were part of a larger longitudinal study of children who had been identified as having language impairments in kindergarten (aged 5–6). Data from the same research suggested that, within the general population, poor comprehenders comprised 3% in grade 2, and this percentage increased across the school years to 6% in grade 4 (aged 9-10), 7.8% in grade 8 (aged 13-14) and 9.6% in grade 10 (as cited by Hogan et al., 2014). Catts et al. (2005) found that despite the grade 8

poor comprehenders performing significantly worse than the poor decoders and control children in language comprehension across previous school years, many had not met the criteria for poor reading comprehension in grade 2. In addition, only approximatively one third of the children had met the criteria for language impairment in kindergarten, and only 18% had received any intervention in the early school years (Catts et al., 2006). This finding is consistent with a study of children aged 8 by Nation et al. (2004), in which none of the 23 poor comprehenders had been reported by their teachers as having any language or reading impairment, despite many meeting the criteria for Developmental Language Disorder (DLD: Bishop et al., 2017) on assessment.

In summary, this discussion of the key literature highlights that poor comprehenders have been identified using a number of different tests and criteria based on the SVR, and prevalence estimates vary across many of these studies. Overall, however, the body of research identifies that approximately 7% of children in the middle of their primary schooling (aged 7-9) might be expected to have difficulties with reading comprehension in the presence of appropriate levels of reading accuracy and fluency. These children are often not identified as poor readers, a major sequela of this being that children progress through their educational years without reaching their potential. Critical to identifying this group is gaining a greater understanding as to how the language profiles of these children might evolve over time, and to identify any predictors to support earlier identification.

The Developing Language Profile of Poor Comprehenders

In an early longitudinal study, Catts and colleagues found the oral language difficulties of 57 poor comprehenders identified on grade 8 (aged 13-14) reading measures to be more apparent on vocabulary and discourse comprehension measures than grammar; this was evident across kindergarten (aged 5-6), and grades 2, 4 and 8 (Catts et al., 2006). Poor decoders were also found to be weaker than the typically developing readers in all three

language comprehension areas in kindergarten, but significantly stronger than poor comprehenders, and scored significantly lower than typical readers on the phonological processing measures in each of the four grades. In contrast, poor comprehenders only differed from the typical readers on the phonological awareness task (sound deletion) when assessed in kindergarten, but not later (Catts et al., 2006). This raises the possibility that poor comprehenders make a slow start in phonological awareness and word reading skills which then quickly resolve (Nation et al., 2010).

Nation et al. (2010), in their longitudinal study, also found that the 15 poor comprehenders selected at age 8 from a cohort of 172 children, performed significantly worse on one of the phonological awareness tasks (sound matching) at 5 years of age. In contrast, and consistent with previous research (e.g., Cain et al., 2000; Nation et al., 2004; Stothard & Hulme, 1995), these children performed at similar levels to reading accuracy matched controls on all remaining phonological and reading measures at all time points (6, 7 and 8 years of age). The poor comprehenders scored at the lower end of average, and lower than the controls, on all oral language tasks at each time point, apart from expressive vocabulary at age 5 (Nation et al., 2010).

In keeping with the SVR, and in an attempt to avoid the complexities surrounding the issue of what reading comprehension tests do assess, Elwer et al. (2013) selected their participants based on *oral* comprehension and decoding skills. In their retrospective analysis, the 99 "poor oral comprehenders" identified in grade 4 (aged 10) displayed weaknesses in phonological awareness and performed worse than poor decoders in preschool (aged 4-5), at the same level as poor decoders in kindergarten (aged 5-6), then significantly better from grade 1. However, the group scored significantly lower than poor decoders on all oral language measures (vocabulary, grammar, verbal memory) at each test point. Elwer et al. (2015) had a similar pattern of results in their group of 56 specific poor reading

comprehenders, selected from the same twin study cohort, where weaker early phonological awareness improved, but deficits were evident on all oral language tasks at all test times from preschool to grade 4 (ages 5–10). Similar to other research (e.g., Catts et al., 2006; Nation et al., 2010), this group of poor comprehenders obtained a lower score on a measure of non-verbal IQ than good comprehenders (Elwer et al., 2015).

In summary, and consistent with previous research on older cohorts of poor comprehenders, the children in these longitudinal studies may show early difficulties with phonological awareness, but generally perform at a similar level to typically developing readers on phonological and reading accuracy tasks once past the preschool years. In contrast, the poor comprehenders present with oral language difficulties from the outset and these are consistent across time. This might indicate the utility of using measures of phonological awareness and oral listening comprehension in identification of poor comprehenders.

Early Predictors of Reading Comprehension Difficulties

Investigation of early predictors of later reading comprehension difficulties has been pursued by Catts and colleagues (Catts et al., 2015; Catts et al., 2016). A group of 366 children, 263 of whom had been identified as at-risk on a school-based early literacy assessment at the beginning of kindergarten (aged 5-6), were assessed on a battery of word reading precursors (letter knowledge, phonological awareness, rapid naming) and oral language tasks. Of the children who were followed through to a final assessment of reading at the end of grade 3 (aged 8-9) oral language (measures of receptive and expressive vocabulary and narrative) was the strongest predictor of later reading comprehension (49%). This was followed by phonological awareness and rapid naming. These three components accounted for 79% of the variance in reading comprehension (Catts et al., 2015). Catts et al. (2016) further investigated whether response to a 26-week Tier 2 language intervention in kindergarten would add to the prediction of grade 3 reading comprehension outcomes. The language

intervention, particularly the response to vocabulary instruction, was found to be a unique predictor over the word recognition and oral language measures (Catts et al., 2016). While Catts et al. (2015) recommended that oral language measures be added to screening of children, along with word reading precursors, the research is equivocal on the value of vocabulary and phonological awareness as early predictors in kindergarten. This line of research highlighted the need for an approach to identification that can be used in the middle primary school years (grades 3-4) when reading comprehension problems become more apparent.

Identification of Poor Comprehenders

Early identification of poor comprehenders is a challenge for educators. As regular screening of oral language is not consistently carried out in Australian schools, and the results from longitudinal or retrospective research show that the oral language difficulties of children who go on to be poor comprehenders are varied and scores are often at a subclinical level, detecting these children as early as possible in primary school remains an ongoing issue. Given the extensive body of research on decoding difficulties in comparison to comprehension difficulties, children with these difficulties are more widely recognised and early intervention put in place (e.g., Hulme & Snowling, 2011; Snowling, 2013). In contrast, the difficulties experienced by poor comprehenders are often "hidden" and less well recognised by teachers, due to the children's ability to read aloud accurately and fluently (Hulme & Snowling, 2011; Nation et al., 2004; Snowling, 2013). This was found to be the case in Nation et al.'s (2004) study in which, of the 23 poor comprehenders, no child was identified by their teachers as having language or learning difficulties, such that many poor comprehenders and their teachers may be unaware of a reading comprehension problem until the children are tested (Hulme & Snowling, 2011; Nation et al., 2004).

Identifying efficient yet accurate methods of identification is another challenge. In an investigation into the presence of subgroups of children with reading comprehension difficulties among a group of Australian School Year 3 and 4 children (aged 7;7-9;5), originally diagnosed with DLD, Kelso et al. (2007) found that, among their battery of tasks, two tasks best predicted whether a child presented with the profile of a poor comprehender or generally poor reader (difficulties with both decoding and reading comprehension). Of the phonological awareness tasks, Phoneme Deletion, from the Queensland University Inventory of Literacy (QUIL) (Dodd et al., 1996) was the best predictor of group membership. Of the oral language tasks, the Listening to Paragraphs task from the Clinical Evaluation of Language Fundamentals (CELF-3) was the only task on which the two groups differed significantly. When a logistic regression analysis was performed using the two best predictor tasks, group membership was successfully predicted 90% of the time.

Identifying tasks that can efficiently discriminate those children at risk of this hidden condition remains critical if these children are to be managed appropriately, with Kelso et al.'s (2007) findings providing promising direction. Little empirical data is available, however, on suitable approaches to support identification of poor comprehenders in the classroom. As it is frequently the case that teachers have limited time and resources available, and are unlikely to conduct detailed one-on-one testing to confirm concerns, the use of tools that can be efficiently administered, either by teachers or other professionals, and are reliable in detecting the likelihood of difficulty, is critical if children with reading comprehension difficulties in the presence of appropriate levels of reading accuracy and fluency are to be identified accurately and efficiently.

Aims of the Study

Drawing on the work of Kelso et al. (2007), the purpose of this study was to investigate whether an approach using two oral language tasks assessing phonological

awareness and listening comprehension could identify poor comprehenders in Australian school year cohorts of Year 3–6. The oral tasks are quick to administer. While the original study recruited children in Australian School Years 3 and 4 (aged 7-9), with DLD, this study sought to extend the age range to include children in School Year 6 (aged 10-12), and recruit a wider sample from the regular school population. The study aimed to evaluate whether initial identification of a poor comprehender profile on the oral tasks, based on those used by Kelso et al. (2007), would be confirmed by a second phase of testing using reading tasks, enabling comparison of prevalence of poor comprehenders to that found in the literature.

To capitalise on the access to classroom teachers provided by the research, teachers were asked to make an informal judgement of the reading ability of the children in their class, with a view to future exploration of teachers as a key resource in achieving higher identification rates of poor comprehenders in the classroom.

Method

The study was conducted in two phases, with all children participating in Phase 1, and children who met the predetermined criteria on the oral tasks progressing to further assessment in Phase 2. Ethical approval was granted by Curtin University Human Research Ethics Committee (RDHS-183-15) and by the Government of Western Australia Department of Education. Written consent was obtained from participating school principals, teachers, students and their parents/guardians.

Participants

Two hundred and eighteen children were recruited to the study, across Australian School Years 3–6. The children attended one of two regular primary schools in inner metropolitan Perth, Western Australia (see Table 1), each drawing from a primarily middle to upper-middle income catchment area. At the commencement of the study, the children ranged in age from 7 years 8 months to 12 years 1 months (92 – 145 months).

Table 1

Number of children in each School Year level and school, and mean age (standard deviation) for each School Year in months

	School Year				
	Year 3	Year 4	Year 5	Year 6	Total
School 1	30	13	16	26	85
School 2	38	38	30	27	133
M (SD)	99.2 (4.1)	112.5 (3.6)	124.8 (4.7)	135.3 (4.1)	

Phase 1 Protocol

Phase 1 testing consisted of two measures, a phonological awareness task and a listening comprehension task, corresponding to the two tasks used in the Kelso et al. (2007) study. The tasks were administered and scored according to the instructions in the test manuals. The responses on the listening comprehension task were audio-recorded for later transcription and analysis.

Measures

Phonological Awareness. The Elision subtest from the *Comprehensive Test of Phonological Processing – Second Edition (CTOPP-2)* (Wagner et al., 2013), an untimed test of phoneme manipulation, was used to measure phonological awareness. The participant was asked to repeat the word presented by the examiner, then say the word that remained when a phonological segment was removed. The internal consistency is .91 and the test-retest reliability .82.

Listening Comprehension. The Understanding Spoken Paragraphs subtest from the *Clinical Evaluation of Language Fundamentals – Fourth Edition –Australian Standardised Edition (CELF-4 Australian)* (Semel et al., 2006) was selected to measure the ability to listen to short paragraphs and interpret factual and inferential information. Five different types of questions were asked for each paragraph. Test-retest reliability is .76 and internal consistency is .70.

Phase 1 Procedure

The oral tasks were administered individually by the first author, in a room at the school away from the child's classroom. The phonological awareness task was presented first, followed by the listening comprehension task.

Criteria for Progression to Phase 2

Potential poor comprehenders were selected if their performance met two criteria drawn from the literature outlined above, based on the SVR, who then progressed to Phase 2 for confirmation assessment. The criteria were:

1. Scaled Score of 7 (16th percentile) or less on the listening comprehension task: *CELF-4 (Australian) Understanding Spoken Paragraphs.* This is equivalent to a Standard Score of 85 (-1 *SD*), a cut-off used in previous studies (e.g., Catts et al., 2003; Nation et al., 2004).
2. Scaled Score of 9 (37th percentile) or above on the phonological awareness task: *CTOPP-2 Elision*. This is equivalent to a Standard Score of 95, consistent with the cut-off used for reading accuracy of a Standard Score greater than 90 or 95 used in previous studies (e.g., Hulme & Snowling, 2011, Nation et al., 2004, Nation et al., 2010), as well as the 10 Standard Score point discrepancy used by Nation et al. (2010).

These criteria were used to ensure that the phonological awareness skills of children who progressed to Phase 2 were robust, with weakness in listening comprehension (-1 *SD* or greater). (Children who were potentially poor decoders or generally poor readers would not meet these criteria.)

Phase 2 Confirmation Testing Protocol

All children who met the above criteria were then assessed on two measures of reading, and a nonverbal intelligence task was administered.

Measures

Phonological Decoding. The Pseudoword Decoding subtest from the *Wechsler Individual Achievement Test-Second Edition - Australian Standardised Edition (WIAT-II*

Australian) (Wechsler, 2007), an untimed test of the ability to decode nonsense words of increasing difficulty, was used to assess phonological decoding. The subtest contains 55 nonwords which the participant read horizontally across three columns until the discontinue criterion was met or the last nonword read. Average test-retest reliability across three age groups is .95, and internal consistency is .96 for age and .96 for grade.

Reading Comprehension. The *York Assessment of Reading Comprehension Primary – Australian Edition (YARC Primary - Australian) – Form A* (Snowling et al., 2012) was used to evaluate reading comprehension. The assessment protocol, developed in the UK, was standardised in Australian schools in 2011. All participants commenced the test at the passage appropriate for their School Year level. The test was administered as per the manual instructions, including encouraging the participants to check back in the text before answering the comprehension questions. All responses were recorded for later transcription and analysis. The second reading passage was selected according to the criteria in the manual, apart from those children in School Year 6 who were all presented the Level 5A and Level 6A passages. Internal consistency for pairs of consecutive passages were .63 to .86.

Nonverbal Intelligence. The *Test of Nonverbal Intelligence, Fourth Edition (TONI-4) -Form A (*Brown et al., 2010) was selected as a language-free test of intelligence, aptitude, abstract reasoning and problem solving. The participant was required to select, from the options presented, the abstract figure with the correct salient characteristics to complete each problem solving task. Testing was discontinued when 3 errors were made across 5 consecutive items. Test-retest reliability is .86-.89 and inter-rater reliability .99.

Phase 2 Procedure

The tasks were administered following the same procedure set out in Phase 1. Reading tasks were completed in the first session (approx. 30 minutes) while the non-verbal IQ task (approx. 15 minutes), was completed in a second session.

Criteria for Classification as a Poor Comprehender

The criteria for confirmation of classification as a poor comprehender were as follows:

1. Scored in the average range for non-verbal intelligence on the *TONI-4*.
2. Scored at the 37th percentile (SS = 95) or above for phonological decoding on the *WIAT-II (Australian) Pseudoword Decoding* subtest, consistent with the cut-off on the oral phonological awareness task.
3. Met one of three levels of criteria for reading comprehension on the *YARC-Primary (Australian) Comprehension* based on criteria used in previous studies reported in the Introduction:
    a) At or below the 16th percentile (SS = 85) i.e., 1 *SD* or greater below the mean
    b) At or below the 25th percentile (SS = 90) i.e., in lowest quartile
    c) Below the 35th percentile (SS < 95) but with a percentile point gap of 20 points or more between their nonword reading and reading comprehension score.

Informal Teacher Judgements

During Phase 1, classroom teachers were asked to make a judgement of the reading ability of each child in their class, as either average, strong or weak. If the teacher judged the child's reading ability to be weak, they were asked "Is the reading difficulty in the area of reading accuracy (decoding), reading comprehension, or both?" Nineteen teachers answered these questions, five School Year 3 teachers and four for each of School Years 4, 5 and 6. None were new graduate teachers.

Data Analysis

Data were entered into an Excel spreadsheet, and then transferred into the SAS version 9.4 software (SAS Institute Inc., Cary, NC, USA, 2008) for analysis. Standard descriptive statistics (mean, standard deviation, range) were used to summarise the profile of

the study participants. Flow-charts were used to describe the numbers of participants falling within particular combinations of results. An Analysis of Variance was used to assess whether there were significant differences in mean scores between year groups, and the Chi-square test used to compare the proportions of poor comprehenders between year groups. A p-value < 0.05 was taken to indicate a statistically significant association in all tests.

Results

Phase 1

In keeping with the SVR framework, the 218 children who participated in Phase 1 were classified along the dimensions of listening comprehension and phonological awareness. The performance of each school year group on the two classification measures is presented in Table 2. No significant difference was present in scores across year groups for either measure (p=0.25 and p=0.66 respectively).

Table 2

Mean (standard deviation) and range of scaled scores on the oral tasks for each School Year level

Assessment Task	School Year			
	Year 3 *n*=68	Year 4 *n*=51	Year 5 *n*=46	Year 6 *n*=53
LC (CELF-4 USP)	9.7 (2.7)	9.7 (3.0)	8.8 (3.5)	9.0 (2.7)
	2-13	4-14	1-15	4-15
PA (CTOPP-2	9.4 (2.6)	10.0 (2.5)	9.8 (3.1)	9.8 (2.0)
Elision)	3-15	5-15	5-15	5-13

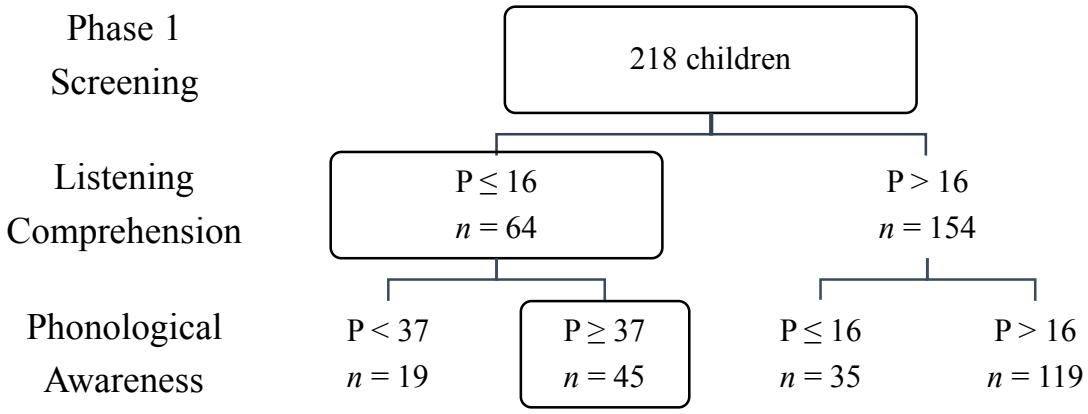
Note. LC = Listening Comprehension; CELF-4 USP = *Clinical Evaluation of Language Fundamentals-4 –Australian Standardised Edition:* Understanding Spoken Paragraphs; PA = Phonological Awareness; CTOPP-2 = *Comprehensive Test of Phonological Processing-2*

Total numbers of children progressing through to Phase 2 are seen in Figure 1. The children were initially classified using their score on the listening comprehension (LC) task, the CELF-4 (Australian) Understanding Spoken Paragraphs (CELF-4 USP) subtest. Sixty four children were found to meet the criteria of a Scaled Score at or below 7 (16^{th} percentile).

Of these, 45 children met the criteria on the phonological awareness (PA) task (CTOPP-2 Elision) of a Scaled Score equal to or greater than 9 (37th percentile) and were therefore considered as potential poor comprehenders. Analysis of Variance confirmed that there was no significant difference in mean score between year groups on the PA task (CTOPP-2 Elision) (p=0.268). There was a significant difference between the scores for LC (CELF-4 USP) (p=0.038) across year groups, primarily because scores in School Year 5 were significantly lower than in School Year 6 (p=0.005).

Figure 1

Flow diagram for children progressing through Phase 1



Note. P = Percentile

The number of potential poor comprehenders in each school year, and as a percentage of the whole year cohort, along with the means and standard deviations on the two Phase 1 measures in each school year group are shown in Table 3. The Chi-square test showed that differences in the proportions of poor comprehenders across year groups did not reach statistical significance (p=0.087). The Mantel-Haenszel Chi-square test, however, showed a significant trend across year groups (p=0.017). The remaining 19 children who achieved a Scaled Score at or below 7 (16th percentile) on the LC task also had difficulty on the PA task, and so were potentially generally poor readers, however, no further testing was undertaken to confirm this profile. Of the 154 children who achieved a score in the average range on the LC

task, 35 obtained a Scaled Score of 7 or below on the PA task, CTOPP-2 Elision, placing them at risk of being poor decoders. These children were also not followed up in this study, such that this profile could not be confirmed. The remaining 119 children scored in the average range on both tasks.

Table 3

Mean (standard deviation) and range of scaled scores on the Phase 1 tasks, and standard scores on the Phase 2 tasks, for potential poor comprehenders within School Year levels

	School Year			
Assessment Task	Year 3	Year 4	Year 5	Year 6
PC *n* (%)	*n* = 9 (13.2)	*n* = 10 (19.6)	*n* = 9 (19.6)	*n* = 17 (32.1)
LC (CELF-4 USP)	5.9 (0.9)	5.5 (1.4)	4.6 (1.9)	6.1 (1.0)
	4-7	4-7	2-7	4-7
PA (CTOPP-2	11.8 (1.6)	11.3 (1.7)	10.9 (2.1)	10.5 (1.4)
Elision)	10-15	9-13	9-14	9-13
NVIQ (TONI-4)	109.4 (10.6)	109.4 (6.8)	106.7 (8.2)	109.4 (9.6)
	91-130	100-124	99-124	94-128
Decoding (WIAT-II	106.6 (10.0)	105.3 (8.2)	107.0 (3.7)	104.7 (5.7)
Pseudowords)	89-118	95-118	100-111	93-111
Comprehension	93.9 (7.5)	93.3 (14.1)	89.9 (8.4)	93.9 (11.0)
(YARC Comp)	85-104	71-121	75-99	71-111

Note. LC = Listening Comprehension; PC = Poor comprehender; CELF-4 USP = *Clinical Evaluation of Language Fundamentals-4 –Australian Standardised Edition:* Understanding Spoken Paragraphs; PA = Phonological Awareness; CTOPP-2 = *Comprehensive Test of Phonological Processing-2;* NVIQ = Nonverbal IQ; TONI-4 = *Test of Nonverbal Intelligence-4;* WIAT-II Pseudowords = *Wechsler Individual Achievement Test-2 - Australian Standardised Edition:* Pseudoword Decoding; YARC Comp = *York Assessment of Reading Comprehension – Australian Edition*

Phase 2 Confirmation Assessment

All 45 children identified as potential poor comprehenders completed the second phase of testing to confirm whether membership of this group was supported, establish whether nonverbal intelligence was within the average range, and enable comparison of prevalence of this group to that identified in the literature. Mean, standard deviation and range of Standard Scores on the two reading and nonverbal IQ measures are presented in Table 3 for each school year group. All children scored in the average range on the TONI-4

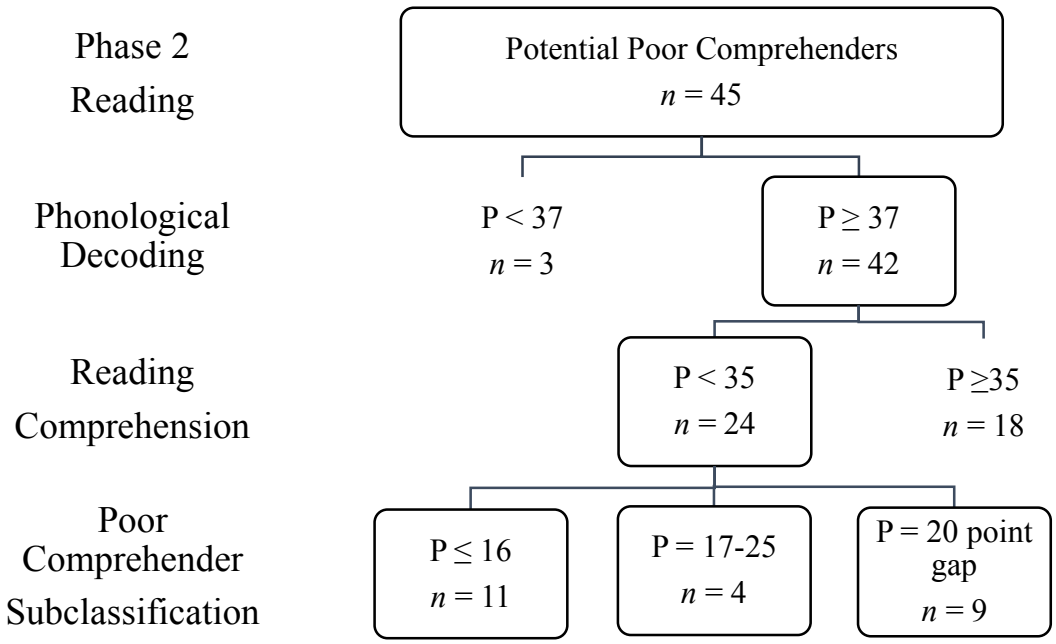
nonverbal IQ task, (Standard Score > 85) ensuring that nonverbal IQ was not a confounding factor (see Table 3). Analysis of Variance confirmed that there was no significant difference between the mean scores on the nonverbal IQ (TONI-4), Decoding (WIAT-II Pseudowords) and Comprehension (YARC Comp) measures between the school year groups: TONI-4 (p=0.879), WIAT-II Pseudowords (p=0.846), YARC Comp (p=0.816).

Total numbers of children progressing through the decision-making stages of the reading assessment are seen in Figure 2.

Step 1: The 45 children were initially examined on their phonological decoding (nonword reading) score from the WIAT-II (Australian) Pseudoword Decoding and 42 children met the criteria of a Standard Score (SS) equal to or greater than 95 (37th percentile). Based on their weaker score on this task, three children were not considered to meet the criteria to be a poor comprehender and were eliminated from the study (two in Australian School Year 3 and one in School Year 6).

Figure 2

Flow diagram for children progressing through Phase 2 reading testing



Note. P = Percentile

Step 2: Scores for the 42 children with average phonological decoding were then examined on the reading comprehension measure, YARC-Primary (Australian) Comprehension, and 24 were confirmed as having difficulties (see Table 4). The remaining 18 children scored within the average range and so were considered to have typically developing reading skills.

Step 3: The 24 poor comprehenders identified in this phase, were further classified according to the three cut-off criteria listed earlier. Eleven children scored at or below the 16th percentile (SS = 85) and are referred to here as "classic" poor comprehenders. Four children scored at or below the 25th percentile (SS = 90), and are referred to as "discrepant" poor comprehenders, with the remaining nine scoring below the 35th percentile (SS < 95) but with a percentile point gap of 20 points or more between their nonword reading and reading comprehension score (see Figure 2). This last group are referred to as "discrepant-gap" poor comprehenders. The prevalence of poor comprehenders in the sample, using the strictest criterion, was 5%. This increased to 6.8% using the lowest quartile criterion, with 10.6% of the cohort meeting the broader 20 percentile point gap criterion.

Table 4

Mean (standard deviation) and range of standard scores on the Phase 2 confirmation tasks for poor comprehenders and typically developing readers

Assessment Task	Group				p-value
	Poor comprehenders (*n*=24)		Typically developing (*n*=18)		
	M (SD)	Range	*M (SD)*	Range	
TONI-4	108.2 (7.3)	97-124	110.2 (10.8)	91-130	0.479
WIAT-II Pseudo	105.2 (5.7)	95-114	108.7 (5.4)	95-118	0.050
YARC Comp	86.0 (6.9)	71-94	103.1 (6.0)	96-121	<0. 001*

Note. TONI-4 = *Test of Nonverbal Intelligence-4;* WIAT-II Pseudo = *Wechsler Individual Achievement Test-2 - Australian Standardised Edition:* Pseudoword Decoding; YARC Comp = *York Assessment of Reading Comprehension – Australian Edition*

* $p < .05$.

A breakdown of the poor comprehenders across both subgroup and school year group is seen in Table 5. The number of children identified as poor comprehenders in each year level as a percentage of those who underwent Phase 2 testing, and as a percentage of the whole year cohort, is also shown. Numbers within the different subgroups, separated into the year groups, were too small for statistical analysis.

Table 5

Number of poor comprehenders by subgroup and School Year level

	School Year				
	Year 3	Year 4	Year 5	Year 6	Total
Potential PC at Phase 1	9	10	9	17	45
Confirmed PC at Phase 2	3	7	6	8	24
Classic PC	2	3	3	3	11
Discrepant PC	0	2	1	1	4
Discrepant-gap PC	1	2	2	4	9
%'age of Phase 1 identified PC	33	70	67	47	
%'age of year cohort identified PC	4.4	13.7	13.0	15.1	

Note. PC = Poor Comprehender

Informal Teacher Judgements

Of the 24 children confirmed as a poor comprehender (either classic, discrepant or discrepant-gap), five were judged to be a weak reader by their teacher: three in School Year 4 and one each in School Years 5 and 6. One of these children was identified as having comprehension difficulties, and the other four difficulties with both reading accuracy and comprehension. Seventeen of the 18 children who performed well on both reading tasks, therefore identified as typically developing readers, were judged to have average or above reading ability.

Discussion

This study investigated whether poor comprehenders in Australian School Years 3-6 (aged 7 to 12 years) attending two regular primary schools could be identified using a short testing protocol consisting of two oral language tasks: a phonological awareness and a listening comprehension task, based on Kelso et al. (2007). Identification of potential poor comprehenders using these tasks was then confirmed through assessment of reading, and considered in the light of prevalence rates identified in the literature.

Effectiveness of Oral Measures in Identifying Poor Comprehenders

The results showed that, of those children identified by the oral tasks as potential poor comprehenders, only 53% were confirmed via performance on the second phase reading tasks. This contrasts with Kelso et al.'s (2007) finding that a phoneme deletion and listening comprehension task differentiated poor comprehenders with 90% accuracy. This differentiation, however, was between two groups of children with DLD rather than children in the broader population. Despite over-identification, the two oral tasks did narrow the number of children requiring more detailed testing of their reading from 218 to 45, thereby reducing the time spent in testing, suggesting a staged process of testing may be possible. This staged process may be useful to, firstly, identify potential poor comprehenders and, subsequently, more efficiently identify this group using reading tasks, such as those employed here, which are more time consuming to administer.

Results from the Phase 2 reading tasks revealed that, consistent with previous research (e.g., Catts et al., 2006; Elwer et al., 2015; Nation et al., 2004), the phonological decoding skills of the poor comprehenders did not differ significantly from those identified as typically developing readers. In addition, the two groups did not differ on nonverbal IQ and all poor comprehenders scored well in the average range or above, which was in contrast with previous research findings (Catts et al., 2006; Elwer et al., 2015; Nation et al., 2010).

Interestingly, an imbalance in identification of potential poor comprehenders was evident across the School Year levels with nearly twice as many Australian School Year 6 children identified compared to the number of children in School Years 3, 4 and 5. The number of School Year 6 children identified was also proportionally more of the School Year 6 cohort screened (32.1%), compared with 13.2% of the School Year 3 cohort, and 19.6% of both School Years 4 and 5. The most likely reason for greater over-identification in School Year 6 could be considered an artefact of the listening comprehension task's (CELF-4 USP) scoring, where there is a shift in the Scaled Score equivalents for raw scores between the norms for children aged 10 versus aged 11; the majority of School Year 6 children being aged 11 at the time of testing. For example, a Raw Score of 10 at age 10 is equivalent to a Scaled Score of 8, while at age 11 it is equivalent to a Scaled Score of 6, and a Raw Score of 11 is equivalent to a Scaled Score of 7. Of the 17 School Year 6 children identified as potential poor comprehenders, 12 achieved a Raw Score of 10 or 11 on the listening comprehension task, but only four were found later to have weak reading comprehension (two each fell into the classic and discrepant-gap subgroups). The remaining five, who had Raw Scores lower than 10, all had weaknesses in reading comprehension.

While the oral tasks over-identified Australian School Year 6 children as potential poor comprehenders, a larger proportion of these children were confirmed as poor comprehenders on the Phase 2 reading tests compared with School Year 3 children: 47% compared to 33%. The robustness of the Phase 1 testing was stronger, however, for School Years 4 and 5, with 70% and 67% respectively of the children identified on the oral tasks found to be poor comprehenders. The number of children who met the poor comprehender criteria following Phase 2 testing also increased between School Year 3 and 4, which equates with the traditional shift in the focus of schools' curriculum from "learning to read" to "reading to learn" (Chall, 1983). Of the total cohort of School Year 3 children, 4.4% were

confirmed as poor comprehenders, which is similar to the 3% of children in grade 2 suggested by Catts and colleagues research (cited by Hogan et al., 2014). The percentage of children meeting the poor comprehender criteria ranged from 13.7% in School Year 4 to 15.1% in School Year 6. These figures are higher than the population figures suggested by Catts and colleagues of 6% in grade 4 and 7.8% in grade 8, but reflect the same increase in prevalence across the school years. Why the prevalence figures are higher in the current study is unclear, but group size and selection methods may be contributing factors.

The oral tasks, combined with the follow-up assessment of reading, can therefore be viewed as being moderately effective in identifying poor comprehenders in School Year 4 and 5. Children in School Year 6 were, more than the other cohorts, over-identified by the oral tasks, largely hypothesised to be due to the structuring of the Australian norms for the listening comprehension task (CELF-4 USP). An alternative cut-off or listening comprehension task is therefore indicated for this age group.

Prevalence of Poor Comprehenders

We were also able to consider the proportion of poor comprehenders within the whole initial cohort of 218 children. Of the 24 children classified as poor comprehenders, the largest group of 11 children, comprising 5% of the original cohort, met the strictest criteria of scoring at or above the 37th percentile (SS = 95) on the phonological decoding task and at or below the 16th percentile (SS = 85) on the reading comprehension task. These standard score criteria were the same as those used by Nation et al. (2004), as well as being consistent with the 1 *SD* discrepancy utilised by Snowling et al. (2009) in the YARC-Primary standardisation, and the minimum discrepancy of 10 standard score points between accuracy and comprehension used by Nation et al. (2010) and Elwer et al. (2015).

When the reading comprehension criterion was broadened to a score at or below the 25th percentile (SS = 90) used by a number of researchers (Elwer et al., 2015; Nation et al.,

2010; Snowling et al., 2009), but without the strict discrepancy criterion, the prevalence increased to 6.8%, which is consistent with the approximately 7 % found in previous research (e.g., Clarke et al., 2010; Elwer et al., 2015; Nation et al., 2010). Finally, when the cut-off was set at below the 35th percentile (SS < 95), with a phonological decoding score 20 percentile points or greater higher, the prevalence figure of 10.6% was more consistent with the early research where poor comprehenders were identified using discrepancy on NARA scores (Stothard & Hulme, 1995; Yuill & Oakhill, 1991). For six of the nine children in this group, the gap in scores was also consistent with the 10 standard score point discrepancy used by Nation et al. (2010) and Elwer et al. (2015) while, for the other three, it was an 8 or 9 point gap.

Limitations and Future Research

In a non-population based study, the particular demographic sample from which participants are drawn does require consideration with respect to interpretation of findings for the broader population. Participants were recruited from only two schools which limited recruiting from a broad range of socio-economic backgrounds, potentially limiting generalisability of the findings. Participation was also dependent on parental/caregiver consent, whereby children in some year groups may have been under-represented. It was also beyond the scope of this study to conduct follow-up testing of reading on children who did not meet the criteria to be potential poor comprehenders in Phase 1 for progression to Phase 2 testing. It is therefore not known if some children with reading comprehension difficulties were not identified as potentially poor comprehenders by the oral tasks in Phase 1. Future longitudinal studies would assist in addressing these questions.

While not a specific research question for this study, the access to classroom teachers provided by the study was utilised to ask teachers to make an informal judgement of the reading ability of the children in their class, with a view to future exploration of teachers as a

key resource in achieving higher identification rates of poor comprehenders. That only five of the 24 children confirmed as a poor comprehender following assessment of their reading were judged to be weak readers is consistent with previous research highlighting that the difficulties of poor comprehenders are "hidden" (Hulme & Snowling, 2011; Nation et al., 2004, Snowling, 2013), and supports the need for future research into better methods of identification of this group.

Implications for Practice

Several implications for practice and professional development are identified by this study. The findings demonstrated that the tasks that targeted the two dimensions of the SVR at an oral language level, one testing phonological awareness and the other listening comprehension were not effective in identifying children with a "hidden" reading disorder in Australian School Years 3-6. Rather, the results provided compelling evidence that reading itself needs to be tested to confirm that a child is a poor comprehender. The results, however, did suggest that using the tasks as a Tier 1 measure that potentially could be administered at a group level to identify children at possible risk of a reading disorder, followed up with a reading assessment, could be effective in identifying children, as only the at-risk children would need to undergo further testing thus reducing the time spent in testing.

The variation in accuracy of identifying poor comprehenders across the different School Year levels suggests that alternative listening comprehension tasks that are both effective and efficient may be required at different School Year levels or ages. Selection of appropriate tasks to aid identification is particularly important if poor comprehenders are to be identified as early as possible in the primary school years for appropriate intervention to be put in place as, consistent with previous research, the prevalence of poor comprehenders in this study was found to increase across school year levels.

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