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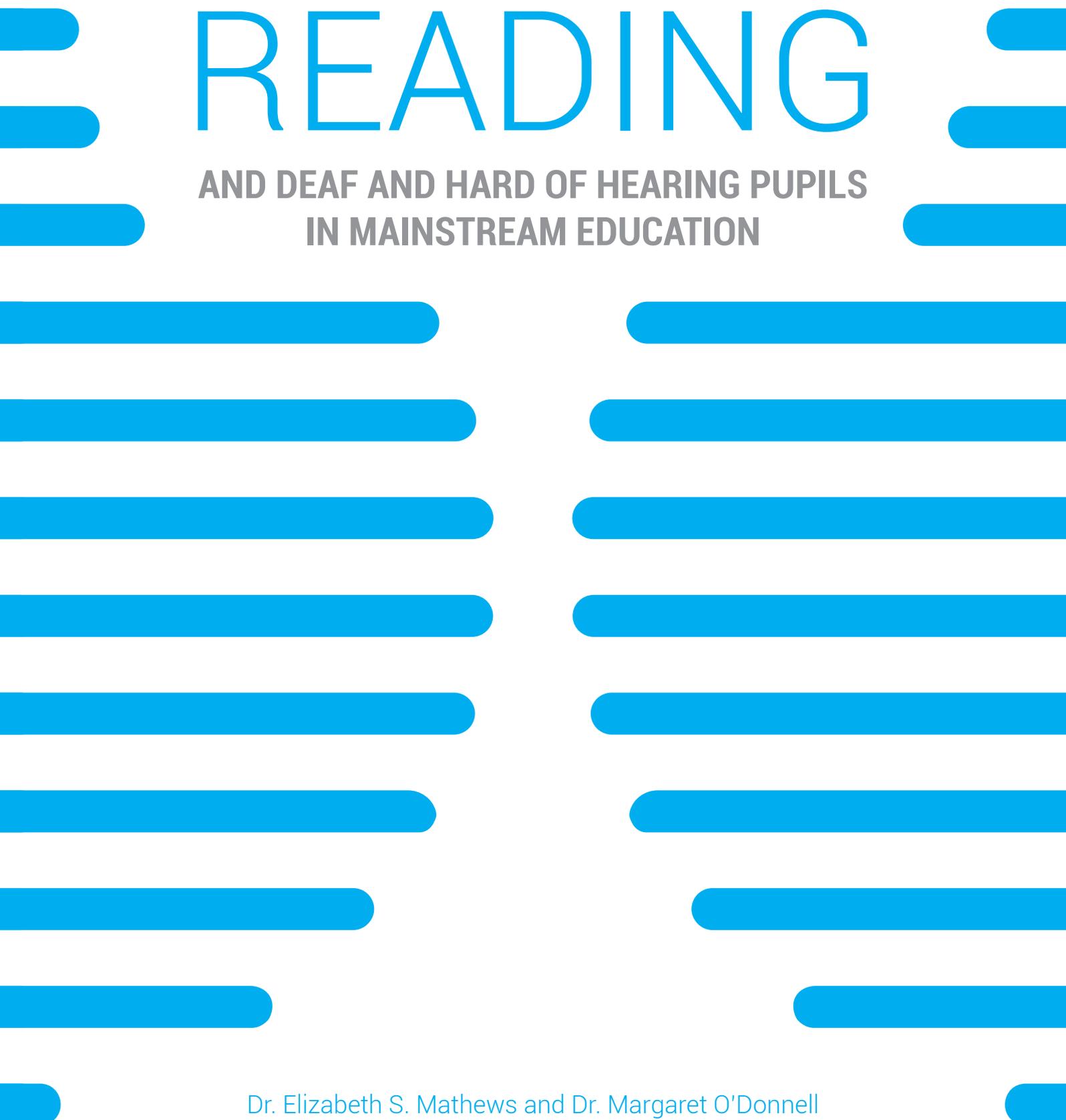
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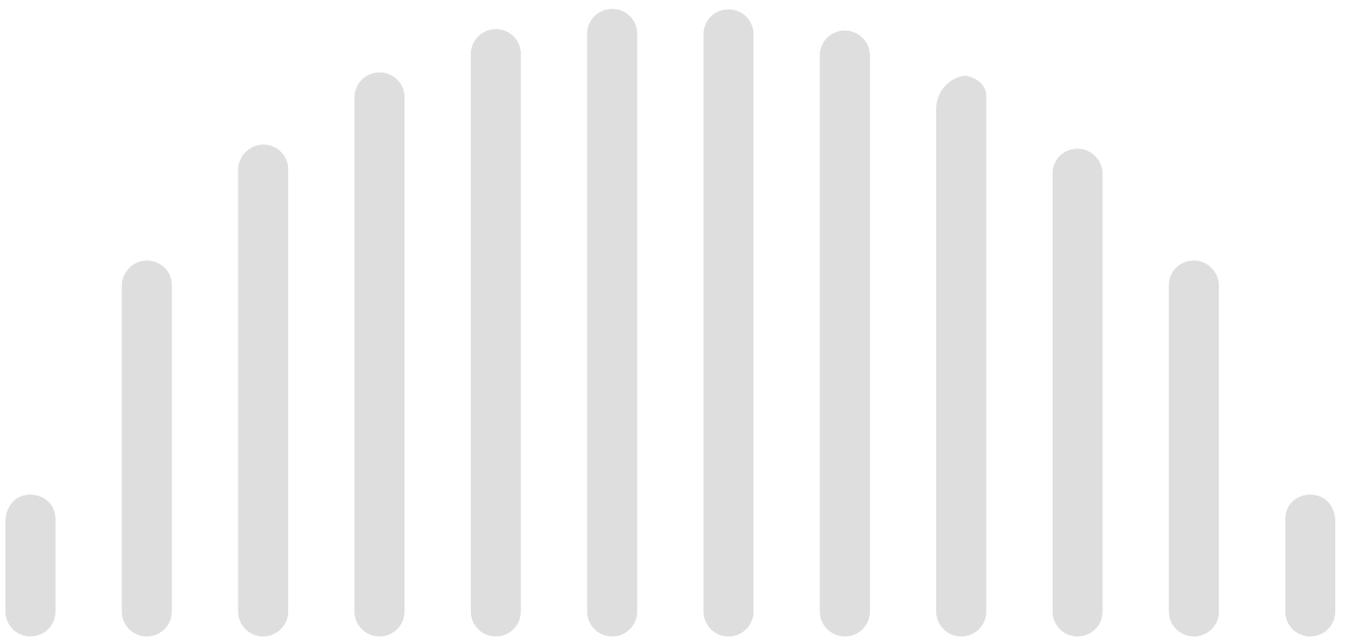
READING

AND DEAF AND HARD OF HEARING PUPILS
IN MAINSTREAM EDUCATION

Dr. Elizabeth S. Mathews and Dr. Margaret O'Donnell

2018

Funded by the Catholic Institute for Deaf People, Chime, and the Irish Deaf Society



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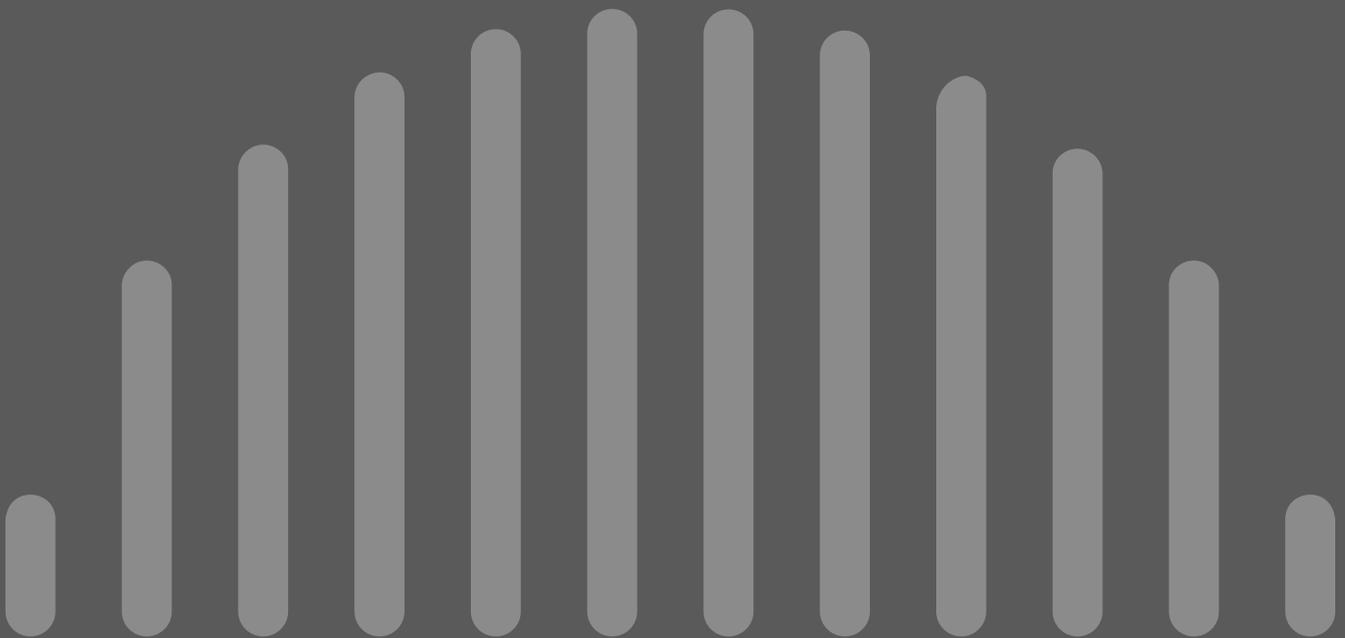
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INTRODUCTION



Mainstream Education for Deaf and Hard of Hearing Pupils

Internationally, the education of pupils who are deaf and hard of hearing (DHH) has changed considerably over the last four decades. Prior to the 1970s, it was customary for DHH pupils to be educated in segregated settings alongside other DHH pupils. Since the 1970s, there has been a flurry of both national and international legislation supporting the integration of pupils with special educational needs into mainstream schools. National legislation was pioneered in the United States in 1975 when President Ford passed Public Law 94-142 the Education for All Handicapped Pupils Act (later to become the Individuals with Disabilities Education Act - IDEA). Public Law 94-142 made two important propositions: that all pupils were entitled to a free and appropriate education and that this education would be provided in the least restrictive environment. While not explicitly stated within the Act itself, the least restrictive environment became widely interpreted as the local mainstream school (Ramsey, 1997). In the UK, similar legislation was enacted in 1981 following the recommendations of the Warnock Committee, thus enabling education for pupils with special educational needs to take place in mainstream schools. These legislative changes culminated internationally in the Salamanca Statement, published in response to the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Conference on Special Needs Equality and Quality in Spain in 1994 which recognises that pupils with special educational needs will achieve their "fullest educational progress and social integration" by being included in their local mainstream school (United Nations Educational Scientific and Cultural Organization, 1994, p. 11).

In Ireland, the legislative move to mainstreaming occurred considerably later, with the *Education Act* in 1998 (Government of Ireland, 1998) and the *Education for Persons with Special Educational Needs Act (EPSEN)* in 2004 (Government of Ireland, 2004). The 1998 *Education Act* mandated that schools provide an appropriate education to *all* students, including those with special educational needs (Government of Ireland, 1998). Again in 2004, the *EPSEN Act* recommended that pupils with SEN should receive their education alongside peers who did not have SEN (Government of Ireland, 2004). However, the earlier Report by the Committee on the Education of the Hearing-Impaired recommended the establishment of a Visiting Teacher Service to support the integration of DHH pupils in mainstream schools (Department of Education, 1972). In the absence of legislation, the creation of the Visiting Teacher Service facilitated, in practice, the integration of DHH pupils in mainstream settings.

Initially, these legislative changes saw the movement of DHH students into a mainstream setting, though not necessarily into a mainstream class. For example, in 1997, while almost half of the DHH student population in the United States was in public schools, only 34% was integrated either part-time or full-time (Holden-Pitt & Diaz, 1998). As a result of this, in the United States the Regular Education Initiative moved the focus to inclusion, stressing that special education services should be provided within mainstream classrooms, thus calling for an end to a dual system of education (Antia, Stinson, & Gaustad, 2002). In Ireland, even prior to legislation supporting inclusion, there were concerns about the high numbers of DHH pupils in segregated provision. In 1990, McGee noted that there were 700 pupils enrolled in schools for the deaf in Ireland and a further 1,500 DHH pupils receiving support from the VTS in mainstream school (McGee, 1990). In spite of the fact that the majority of pupils at that stage were enrolled in mainstream, the Report of the Special Educational Review Committee noted that in light of "a general trend towards the integration of special educational provision, such a level of segregation [in schools for the deaf] would appear to be inappropriate" (Government of Ireland, 1993, p. 109).

Consequently, since the 1970s, and more noticeably since the late 1990s, there has been a decline in the numbers of DHH pupils attending specialised settings and an increase in those in mainstream settings, such that the latter group is now the overwhelming majority. In the midst of such change, it is perhaps surprising that so little research has been carried out on the educational outcomes of DHH pupils in the Republic of Ireland. With the exception of a handful of qualitative studies (Howlett, 2008; Mathews, 2018), there exists a dearth of research detailing the academic or social outcomes of DHH pupils. As such, the current research focus is both timely and warranted.

Literacy and DHH Pupils

While there is a dearth of research into educational outcomes for DHH pupils in Ireland, there exists a large corpus of work on this topic internationally, as evidenced by a considerable number of meta-reviews on the literature in the field (eg Lederberg, Schick, & Spencer, 2013; Luckner & Cooke, 2010; Luckner & Handley, 2008; Luckner & Urbach, 2012; Marschark, Rhoten, & Fabich, 2007). Over the last number of years, research into outcomes for DHH pupils shows varied results. This is perhaps reflective of the changes in early identification and improved technology allowing some (though not all) DHH pupils to make gains compared to historical attainment levels. While there is a body of research showing that DHH pupils lag behind their hearing peers across the board academically (Powers, Gregory, & Thoutenhoofd, 1998; Thoutenhoofd, 2006), some studies show that the majority of pupils in their sample are performing within the normal range expected for hearing students (Antia, Jones, Reed, & Kreimeyer, 2009). However, even for the more optimistic studies, slower progress in reading remains an area of concern (Antia et al., 2009). It is this general underachievement of DHH pupils compared to their hearing peers in reading skills (Kyle & Harris, 2006; Thoutenhoofd, 2006), that is deemed to be particularly important since, as Marschark and colleagues highlight: “despite DHH students’ chronic difficulties in reading, recent studies have found that at least from middle school onward, they learn just as much from text as they do from sign language or spoken language in the classroom” (2015, p. 351). Subsequently, accessing information from text remains a pivotal skill for DHH pupils’ academic growth, and continued monitoring of skills in this area is a topic of necessary enquiry.

Assessment of Literacy in Irish Schools

When we speak of assessment of literacy skills, we need to understand what literacy encompasses. The National Strategy for Literacy and Numeracy (Department of Education and Skills, 2011) notes that literacy includes “the capacity to read, understand and critically appreciate various forms of communication including spoken language, printed text, broadcast media, and digital media” (Department of Education and Skills, 2011, p. 8). While the definition is broad, critically, it recognises the importance of conceptualising literacy to include reading, writing, communication and oral language in both print-based and digitised formats. For some DHH children, literacy in Irish Sign Language is a further consideration. Literacy then is the ability to read and write but it is also about constructing meaning about the various modes of communication valued by society. Further to this, assessment in education is about “gathering, interpreting and using information about the processes and outcomes of learning” (National Council for Curriculum and Assessment, N.D.). Assessment is used to monitor the learning processes, to ascertain achievement in each area of the curriculum and to prioritise learning needs. It enables teachers to make critical decisions about the effectiveness of particular instructional strategies, and the need to provide differentiated curriculum content. Assessment assists communication about pupils’ progress and development between teacher and pupil, between teacher and parent, and between teacher and teacher. The closer the connection between the educational assessment and instruction, the more effective the assessment-teaching process will be (Lerner, 2003).

The Education Act (Government of Ireland, 1998) places a statutory responsibility on principals and teachers to give parents accurate and clearly accessible information on their pupils’ progress. Progress and literacy warrants particular attention. Schools are required to administer standardised tests in reading and mathematics in second, fourth and sixth class and these results are communicated to parents, Boards of Management and the Department of Education and Skills (DES). This points to the particular importance of ongoing assessment of literacy and numeracy in Irish schools. Indeed, in his forward address in The National Strategy to Improve Literacy and Numeracy among Pupils and Young People 2011-2020, Ruairí Quinn, then Minister for Education and Skills stated that:

Literacy and numeracy are among the most important life skills that our schools teach. No child should leave school without having mastered these skills to the best of their abilities. Literacy and numeracy skills are crucial to a person’s ability to develop fully as an individual, to live a satisfying and rewarding life and to participate fully in our society. Ensuring that all young people acquire these skills is one of the greatest contributions that we can make to achieving social justice and equity in our country (Department of Education and Skills, 2011, p. 5).

The *Education Act* (Government of Ireland, 1998) places another requirement on schools, namely to provide for the needs of all students, including those with identified SEN. Subsequently, the assessment and monitoring of progress of pupils with special educational needs, including pupils who are DHH is an important function of schools, and assessment of literacy is a crucial component of this process.

However, at the discretion of the school principal, pupils can be exempt from this standardised testing process if they have a disability which would hinder them from completing the test. While data is collected on the number of pupils exempt from testing, the reason for the exemption is not given. As a result, nationally reported data on literacy and numeracy attainment is likely to exclude some pupils who are DHH, but the exact numbers are unknown. Furthermore, the National Literacy and Numeracy Strategy highlights that “while many students in our education system achieve very good standards of literacy and numeracy, a significant minority do not. In addition, many students acquire adequate skills but could do even better” (Department of Education and Skills, 2011, p. 12). Given the statutory obligations around assessment and the importance afforded to literacy in the assessment process, it is unfortunate that very little is known about overall literacy outcomes for DHH pupils in the Republic of Ireland. It is more worrying given that the international literature would suggest that this is a domain of difficulty for this cohort of pupils. Subsequently, this study aims to address two distinct questions:

1. What are the current reading outcomes for a sample of DHH pupils in primary mainstream schools?
In particular

- a) is there a gap between particular sub-skills involved in reading (phonological decoding and reading comprehension)?
- b) what factors are related to better reading skills?

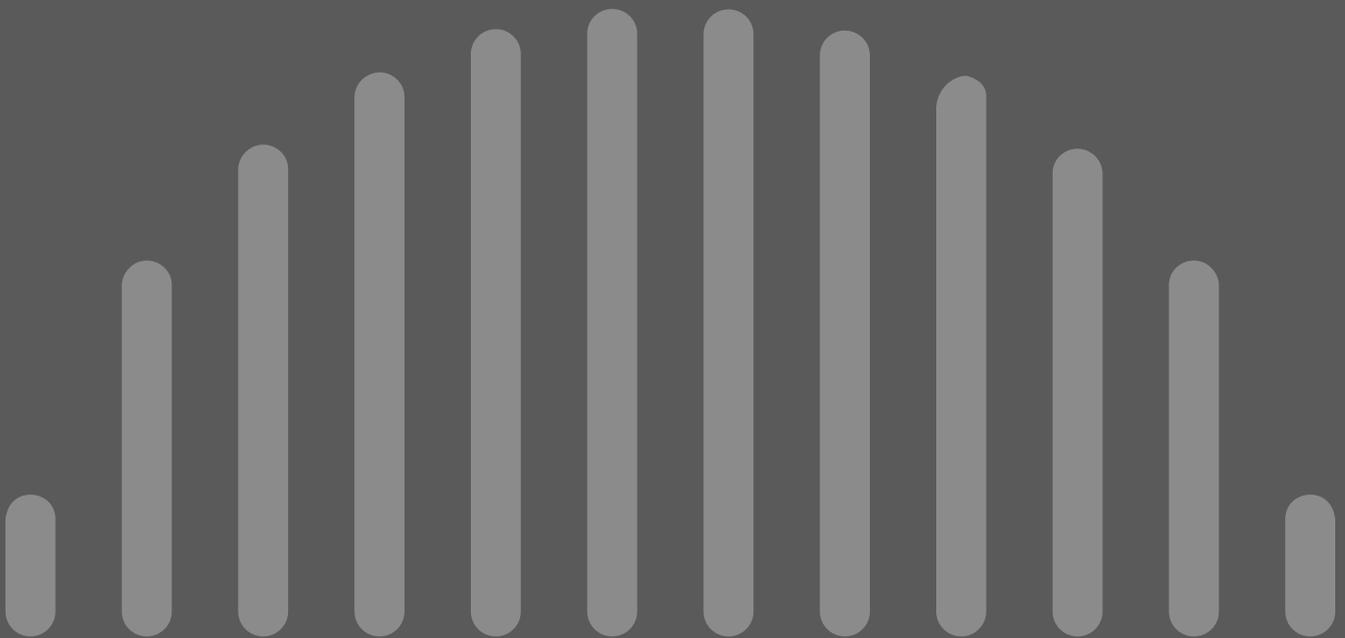
and,

2. How is progress in reading for DHH pupils measured by teachers?

Structure of this Report

Chapter 2 of this report examines the literature relating to literacy and DHH pupils and the assessment of literacy. Following this, the research design and data collection and analysis methods are detailed in Chapter 3. Chapter 4 presents and discusses the findings from the study. Chapter 5 provides a conclusion for the report, including limitations and implications of the study, and recommendations arising from the study.

LITERATURE REVIEW



In sourcing literature for the current review, an extensive search was carried out on academic databases containing peer-reviewed articles published in international journals. Results were focused on peer-reviewed journal articles from 2000 onwards and those relating to primary and post primary education were prioritised. Older studies are included if they are seminal studies or if they feature research relating specifically to Ireland (as there exists a dearth of research on literacy and deaf education in the Irish context). Published meta-reviews of relevant literature, monographs on literacy and DHH pupils, and empirical studies with large samples were prioritised. The review begins with a discussion about literacy outcomes for DHH pupils. It covers three main themes emerging from the literature: lower reading ages, a gap that widens with time, and multifaceted and complex difficulties with literacy. There is also a brief discussion on the factors that influence reading outcomes. The discussion then moves to classroom implications such as how reading is taught and assessed.

DHH Pupils and Literacy

Literacy acquisition among DHH pupils is thought to be the “most long-term and vexing challenge for deaf education” (Spencer & Marschark, 2010, p. 81). It has received much attention from research internationally and in a review of the research in the field from 1963-2003, 964 articles were found relating to literacy and DHH pupils, although concerns have been raised about the overall quality of the research in the field (Luckner & Handley, 2008). While the outcomes reported in research can vary, overall the research shows us that, at least historically, DHH pupils tend to have lower reading scores compared to their hearing peers, that this gap widens with age, and that their difficulties with reading are multifaceted and complex.

The Trend of Lower Reading Scores

In the 1970s, the average reading age of DHH school leavers was reported to be age 9 (Conrad, 1979). Holt’s (1993) landmark study on the Stanford Achievement Test for Hearing-Impaired of 6,500 DHH students again found that the median reading age of 17 year old school leavers was 9.5 years. Similar results were found in a 1990 study carried out in Ireland which reported average reading ages for 16 year old DHH pupils at 9.2 years of age (James, O’Neill & Smyth, 1991) and again in the US nearly a decade later (Traxler, 2000). More recent studies show that below average performance in reading (Albertini & Mayer, 2011; McDonald Connor & Zwolan, 2004; Thoutenhoofd, 2006) is still evident.

However, there have been some studies showing DHH pupils achieving closer scores to their hearing peers, in particular in the wake of cochlear implantation and earlier identification and intervention (Johnson & Goswami, 2010). One of the most cited of these is Geers’ (2003) study of 181 pupils who used cochlear implants. Over half the pupils in Geers’ study (2003) had reading scores within normal range, defined as standard scores above 85. Later studies with similar findings include Dillon, de Jong and Pisoni’s (2012) where two thirds of the sample in the study achieved reading scores within normal range. Spencer, Barker and Tomblin (2003) found that the 16 pupils with cochlear implants in their study were reading within a normal range on standardised test results, although it should be noted that statistical testing revealed a significant difference between the mean scores of the two groups (standard score of 90.13 vs 99.5 for DHH and hearing age-matched control group respectively). In a separate study, Spencer, Gantz and Knutson (2004) found that the children with early implants who had access to sign language interpreters through their education were, on average, reading on a par with their hearing peers. While these results indicate a more positive turn, it should be noted that a considerable proportion of the samples in the studies above were still not reading within normal ranges. A more promising proportion was found in Mayer et al (2016) study, which used the York Assessment of Reading Comprehension and found that 88 percent of their participants (n=33) scored within or above normal ranges. However, they caution that their sample may not be representative of DHH pupils generally since the sample was self-selecting, came from supportive home environments, tended to be from affluent socio-economic areas, and had fewer complex needs than would be expected in the population of DHH pupils. Similar problems emerged in the current study and will be discussed later. Another issue with testing is that occasionally so-called underperforming pupils can be excluded from findings because they failed to complete a sufficient amount of the test for analysis (Dillon & Pisoni, 2006). Subsequently, more positive results may fail to capture the lower ranges of ability since some children are excluded from the testing process.

A Gap that Widens over Time

As well as the general delays reported in the literature, it would appear that as DHH pupils get older, the gap between them and their hearing peers widens (Dillon et al., 2012; Geers, Mitchell, Warner-Czyz, Wang, & Eisenberg, 2017; Harris & Terlektsi, 2011; Harris, Terlektsi, & Kyle, 2017a; Kyle & Harris, 2010; Mayer et al., 2016; Thoutenhoofd, 2006; Vermeulen, van Bon, Schreuder, Knoors, & Snik, 2007; Walker, Munro, & Rickards, 1998). In other words, while DHH pupils may be close to their peers or only marginally behind at age five, six or seven years, the gap is likely to increase as they progress through primary school.

Longitudinal studies, measuring progress over time, are particularly informative on this issue. One recent finding emerging from longitudinal studies is that for children with cochlear implants who have initially shown some more promising results, do not maintain the gains seen in the early years. In their study of 105 DHH pupils who had received cochlear implants, Archbold and colleagues (2008) examined the relationship between age of implantation and literacy outcomes at two points after implantation (five years and seven years). They used the Edinburgh Reading Test to establish reading ages for the pupils in their sample. They found that pupils with earlier implantation (at or before 42 months) had age-appropriate reading levels at both five years and seven years after implantation. However, those with later implantation had an average net reading age lag of -1 year 9 months five years after implantation and -2 years 11 months at seven years. However, it is important to note, that while the early implant group pupils showed age-appropriate reading levels at both points after implantation, they too showed deterioration in their net reading age at seven years compared with that measured five years after implantation. Unfortunately, a further follow up study, on this cohort, has yet to be published.

Other studies of pupils with cochlear implantation have been less promising. Three studies with larger samples are discussed here. Thoutenhoofd (2006) examined data collected in Scotland on attainment of 152 DHH pupils who use cochlear implants. The pupils were included in a larger database for the Achievement of Deaf Pupils in Scotland (ADPS) study which contains data on 1,752 DHH pupils. Thoutenhoofd's (2006) analysis showed a wide variability in reading ages among the pupils in the sample and while some pupils were reading at or above their grade level, the majority were performing below their hearing peers. McDonald Connor and Zwolan's (2004) study on 91 pupils with cochlear implants also reported mean scores in reading comprehension for their sample that were below average. In a Dutch study, 50 DHH pupils using CIs were compared to a sample of DHH pupils who did not use CIs ($n=500$) and a sample of hearing pupils ($n=1,475$) (Vermeulen et al., 2007). Results showed that the pupils using CIs had better reading scores than DHH pupils without, but still lagged considerably behind the scores of their hearing peers. However, all of these studies are dated and it is possible that not all of the pupils involved benefitted from early identification and intervention, both of which contribute to better outcomes (Yoshinaga-Itano, 2004).

As a result, further longitudinal research is needed to see if the positive scores found in the early years after implantation continue generally, or (as was the case in Archbold et al., 2008) if these gains diminish as the reading material pupils encounter becomes more complex over time. Longitudinal studies should also include children without implants and those with milder losses to ensure that findings are generalisable to the full spectrum of DHH children. While the current study did not aim specifically to measure outcomes of pupils with cochlear implants, this observed decline in net reading age over time served as the rationale for choosing three distinct groups within the sample (1st/2nd; 3rd/4th; 5th/6th) in order to examine whether or not a similar pattern might be observed.

Multifaceted and Complex Difficulties

Part of the difficulty in both researching and tackling this underachievement in literacy is the complex range of interdependent skills involved in successful reading. In their meta-analysis on reading and DHH pupils, Lederberg, Schick and Spencer (2013) summarise that there are two major skill sets that influence outcomes in reading: "general underlying language ability, and the ability to use spoken phonological knowledge for decoding printed words" (Lederberg et al., 2013, p. 23). The skills involved in 'underlying language ability' include background knowledge, vocabulary, language structures, verbal reasoning, and literacy knowledge.

The second skill set includes phonological knowledge and decoding. Trezek, Wang and Paul (2010) refer to these two skill sets as processing print (for word identification and decoding) and the knowledge domain

(for comprehending). These two domains or skill sets represent what is known as the *Simple View of Reading* (SVR), a formula originally presented by Gough and Tunmer in 1986. This SVR formula was reconceptualised by Rose (2006) as a broad model for understanding reading in which two teachable skills D (Decoding/ Word recognition) and LC (Language Comprehension) are placed centre stage along a continuum. Understanding the formula, Rose claims, can help educators with assessing reading weaknesses and providing appropriate instruction. The SVR formula makes clear that strong reading comprehension cannot occur unless both decoding skills and language comprehension abilities are strong.

As a result of these two major skill sets, they are assessed separately in this study using the Edinburgh Reading Test (ERT) (for comprehension) and the Non-Word Reading Test (NVRT) (for phonological decoding), although decoding is also inherently assessed in the ERT since comprehension of text implies that it has been successfully decoded. The NVRT was chosen as a measure specifically of phonological decoding given its importance in reading and given the profile of the participants in this study i.e. pupils who are using spoken language and listening to access the curriculum. It also enabled us to separate out phonological decoding as a mechanical process (piecing together the speech sounds that make up words) from the more holistic skill set involved in comprehending text.

A review of the literature indicates that both skill-sets present problems for DHH students who struggle with multiple components of literacy including word recognition (Kyle & Harris, 2010), comprehension (Luckner & Handley, 2008), reading fluency (Luckner & Urbach, 2012), morphological knowledge (Trussell & Easterbrooks, 2017), knowledge of genre, motivation, and other skills (Luckner & Handley, 2008). In a study using miscue analysis, Albertini and Mayer (2011) showed that while a task assessing word reading only placed their participants at the fourth grade reading level, miscue analysis of the participants on a second test showed a broad range in reading comprehension abilities within the cohort. In their meta-analysis on acquisition and development of literacy skills, Spencer and Marschark (2010) point to a wide range of sources showing deficits in phonological awareness, vocabulary size and syntactic knowledge among DHH pupils. They also highlight the interdependent nature of these skills. For example, it is unclear if better phonological awareness leads to better reading skills or if better phonological awareness comes about *because of* increased reading activity. This inter-relationship between factors exists both across the skill domains of language ability and decoding, but also within these domains. Kelly (1996 cited in Spencer & Marschark, 2010) demonstrated that delays in one area (e.g. syntactic knowledge) can prevent students from successfully using skills in another area (e.g. vocabulary). Similarly, delays in one area, such as phonological skills, has been shown to correlate with lower skill level in the other major domains, such as vocabulary knowledge (Dillon & Pisoni, 2006).

General comprehension also presents challenges for DHH pupils (Harris et al., 2017a; Kyle & Cain, 2015), in particular inferential comprehension (Kyle & Cain, 2015; Walker et al., 1998), perhaps owing to general underlying language delays and the subsequent inability of pupils to make use of their existing language skills to scaffold their literacy development. All in all, successful reading involves the mastery and simultaneous execution of a range of skills and to a great degree hinges on robust underlying language ability. Since spoken English is not always readily accessible to DHH pupils because of their hearing loss, and since sign language is not often readily accessible since the vast majority (more than 90%) of DHH pupils are born to hearing parents who are unlikely to know sign language, many DHH pupils arrive to school with language delay which will impact later on their literacy development.

Language is the conduit through which children come to understand their world, to relate and communicate and to develop their personal skills and competencies as effective communicators (Irish National Teachers' Organisation, 2004). It is through language children make sense and interpret their world and develop communicative relationships, initially with their parents, and subsequently through engaging in social engagement with others (Irish National Teachers' Organisation, 2004). In terms of its contribution to reading, language provides access to a breadth of *word* knowledge (vocabulary) as well as *world* knowledge, both of which can be delayed in DHH children (Convertino, Borgna, Marschark, & Durkin, 2014). Through language, children can learn about things it is no longer possible to experience (the Industrial Revolution, dinosaurs), things they might never experience (space travel, safari) and things that are beyond the realm of physical experience (hope, inspiration). Compromised access to a first language undermines this learning for DHH children. Language delay (regardless of the language modality being used) impacts on the language comprehension skills needed to comprehend text and spoken language delay has a direct impact on phonological awareness. Studies consistently show that language scores correlate with literacy outcomes among this population (McDonald Connor & Zwolan, 2004), regardless of modality i.e. whether the first

language ability is signed or spoken (Lederberg et al., 2013) or a combination of both (Spencer et al., 2003). Indeed, some studies have shown that for DHH children, language skills (such as vocabulary and syntax knowledge) appear to be more predictive of reading ability than phonological awareness (Geers & Hayes, 2011; Mayberry, del Giudice, & Lieberman, 2011). Language experience is inextricably linked to DHH pupils' ability to both engage with and make sense of text (Marschark 2007a in Swanwick, Kitchen, & Clarke, 2012). Much of that language experience is based in the home and so examining home language and literacy practices was seen as an important component of this study. Given the importance of language skills relating to literacy, this study included a parent questionnaire where a range of questions were asked about language and literacy practices in the home. It was outside the scope of the study to test overall language abilities among the pupils, although teachers were asked how they assessed language, and there was a vocabulary component in the ERT.

Vocabulary in particular appears to present difficulties for DHH children (McDonald Connor & Zwolan, 2004) with overall themes of delayed acquisition of vocabulary, lower vocabulary stores across narrower contexts and slower rates of learning new vocabulary (Luckner & Cooke, 2010). In their sample of 29 DHH seven and eight year old pupils, Kyle and Harris (2006) found significantly lower vocabulary ages with a mean of 3 years 7 months compared with the mean chronological age of their group (7 years 10 months). In her meta-analysis on vocabulary knowledge of pupils with cochlear implants, Lund (2016) concludes that even those DHH pupils with cochlear implants have lower vocabulary knowledge compared with their hearing peers. While she notes that there has been conflicting evidence on language outcomes for pupils with cochlear implants to date, she concludes that these differences may be explained by factors relating to the studies such as different comparison groups, measurements used or characteristics of pupils. Importantly, her meta-analysis found that effect size is not lowered by age of implantation, suggesting that even pupils with early intervention may not obtain vocabulary levels on a par with their hearing peers. Similarly, Convertino et al., (2014) found that cochlear implantation did not close the gap in terms of vocabulary knowledge, although many of the college students using cochlear implants in this study reported relatively late implant ages compared with pupils identified through UNHS. Overall, it would appear that difficulties with language skills generally (Goberis et al., 2012) and vocabulary specifically (Harris, Terlektsi, & Kyle, 2017b) persist, in spite of early identification and intervention.

As well as the impact of language delay on vocabulary, the difficulty experienced by DHH pupils in acquiring *spoken* language specifically, limits their phonological awareness. This means that even for the small minority of DHH pupils with DHH parents for whom normal language acquisition through sign language occurs, issues with phonological awareness can affect their progress in reading. While this cohort may compensate with alternative decoding strategies such as orthographic techniques or sight recognition of words, they appear to be less effective than phonological codes (Musselman, 2000) and research would suggest that many DHH students use phonological encoding even when their abilities in that domain are limited (see Musselman, 2000 for discussion). This is an important consideration since print literacy is a representation of a spoken language. The vast majority of hearing pupils gain access to print literacy by drawing on their knowledge of the spoken language that it represents, sounding out unknown printed words to try to link them with words from their spoken language repertoire. This phonological awareness, part of a larger set of 'word attack skills', gives pupils the ability to comprehend a text even when unknown words are presented. Phonological awareness is noted as a strong predictor of later literacy success in hearing pupils, but the evidence for DHH is not as strong (Mayberry et al., 2011). This may be because, unlike hearing children, decoding a word does not necessarily lead to understanding if there is simultaneously a difficulty with underlying language ability. This was evident in a study on the effectiveness of a phonics intervention with DHH children by Trezek and Wang (2006) who found, perhaps not surprisingly, that pupils made gains in word reading and non-word decoding (both skills directly linked to phonics) but did not make gains in comprehension. This demonstrates that an emphasis on the mechanics of phonics can lead to improvements in some skills relating to reading, but does not necessarily help with overall comprehension— especially if underlying language skills are not developed. However, it is clear that DHH pupils can acquire phonological awareness, though they may acquire it using a range of alternative strategies compared with their hearing peers (Trezek et al., 2010).

Given the complex range of skills involved in reading, it is important to keep in mind the particular skills tested in individual studies. For example, several studies have used the Peabody Individual Achievement Test (PIAT) Revised subtest to assess reading comprehension (Dillon et al., 2012; Dillon & Pisoni, 2006; Geers, 2003). This assessment only tests for literal comprehension at the sentence level and studies using assessments examining passage comprehension and testing for inferential comprehension have had less promising results (Harris et al., 2017a; Kyle & Cain, 2015). Thus, DHH pupils may perform less well on reading comprehension

tests than their word-reading ability would indicate they should. Subsequently, two distinct tests were used in this study to separate out these two domains.

What External Factors Influence Reading Attainment?

As well as the large body of research into literacy achievement, many researchers have sought to examine the background factors (many external to the child's deafness) that influence reading outcomes in this cohort. Some of the academic underperformance of DHH pupils has been blamed on delayed identification, delayed intervention and the subsequent implications for appropriate language development. Indeed, age of intervention (Archbold et al., 2008; Mayer et al., 2016; McDonald Connor & Zwolan, 2004) has been shown to be a strong predictor for later reading achievement. Universal Neonatal Hearing Screening (UNHS) means that most children who are born DHH are now identified in early infancy, presenting an opportunity for early intervention through, for example, cochlear implantation. However, this has only been in effect since 2013 across Ireland. Prior to this, identification of deafness in children was noted following a series of infant screening checks. While national data is not available, Mathews (2018) found that the average age for final audiological diagnosis among her sample of 25 DHH children to be 19 months. Research has shown that the optimal timeframe for intervention is 6 months of age (Yoshinaga-Itano, 2004). Subsequently, many of the current cohort of DHH pupils in mainstream primary schools will not have benefitted from early identification and intervention.

In research with hearing children, there is a growing awareness that parental involvement in children's learning is positively related to achievement (Cotton & Reed Wikelund, 2001). These improved educational outcomes do not necessarily depend on the formal literacy levels of the parents, but the climate in which children are encouraged, given opportunities to read, provided with recognition of their attainments and subject to interaction and modelling of language and daily problem solving activities (Brooks, Pahl, Pollard, & Rees, 2008). In looking at the research on the impact of how parent-child book reading experiences result in positive academic outcomes in later years, the meta-analyses of the early empirical evidence on this issue conducted by Bus, van IJzendoorn, and Pellegrini, (1995) concluded that firstly, the level of parent-book reading to pre-school children was positively related to important outcome measures including language growth and literacy achievement. Secondly, the study findings show that book reading in the home was equally as important as phonemic awareness as a predictor of later reading achievement. Lastly, the impact of parental reading in the home was age dependent – the younger the child – the more impact – with diminishing results as children acquired independent reading skills.

In more recent times, the meta-analyses by Sénéchal and Young (2008) which focused on children from kindergarten to Grade 3, was based on 16 intervention studies with a total of 1,340 families and examined which aspects of family literacy interventions were critical in bringing about improvements in reading acquisition. They note that parents can be involved in their children's literacy development in a variety of ways ranging from general aspects of parenting to specific involvement in learning activities including reading. The main finding, supporting the earlier review, was that parent-child reading activities had a positive impact on children's reading acquisition. The particular type of activity that parents engaged in resulted in different outcomes, for example when parents tutored their children using specific literacy activities this yielded larger effects than those in which parents listened to their children read books.

In another five-year longitudinal study by Sénéchal and LeFevre (2002), findings reveal that children's exposure to books related to vocabulary development and language (listening) comprehension, and that these skills in turn related directly to reading ability in Grade 3. Sénéchal, Pagan, Lever and Ouellette (2008) examined the vocabulary and morphological knowledge in 106 four-year-olds, and concluded that home shared reading practices subsequently impacted on expressive language skills irrespective of children's non-verbal intelligence, parents' education and parents' literacy. In conclusion, the importance of parent-child reading activities in the early years has significant impact across many literacy domains.

For DHH children, parental involvement (Calderon, 2000), in particular participation in school (Antia et al., 2009) and activities such as dialogic reading (Fung, Chow, & McBride-Chang, 2005) has also been shown to have positive results. So too does better socio-economic backgrounds (Geers, 2003; McDonald Connor & Zwolan, 2004). Level of deafness also seems to have an impact, with pupils who have less severe hearing losses being more likely to have age-appropriate reading levels (Kyle & Harris, 2006, 2010). However, level of hearing loss is

not always a predictor for attainment in the way we might expect. Thoutenhoofd (2006) found that pupils with milder levels of hearing loss (20-40 dB) were performing less well in reading, writing and mathematics at the lower levels of attainment than pupils with moderate, severe or profound losses. Similarly, Marschark et al. (2015) found milder levels of deafness to be a significant negative predictor of achievement in maths, where more serious levels of deafness were not.

Due to the wide range of factors that can influence reading attainment, the current study collected background demographic information from parents in the form of a questionnaire and these were used during statistical analyses to examine whether groups with different demographic differences had significantly different reading outcomes.

Teaching and Assessing Reading

The importance of pupils acquiring good reading skills cannot be over emphasised - reading skills are fundamental to acquiring many other skills, academically and professionally. In developing good comprehension skills, pupils use a range of cognitive strategies to include visualising as they read the narrative material, posing questions to themselves, reflecting on what they read, challenging the accuracy of stated facts and monitoring their own level of understanding (Westwood, 2003). Pearsons (2009) claims that the reader may be viewed as a *builder*, a *fixer*, an *assembler*, and as a *responder*. The reader may be viewed as a *builder* in that there is a need to draw on prior knowledge so as to iteratively connect with, sift, refine and organise information to construct meaning from text (Anderson, 2004). The reader as *fixer* (Pearson, 2009) engages the reader as a metacognitive, self-regulatory, problem-solver, where the reader operates on ideas and questions the text. The process of pupils generating questions allows them to become more active and more involved in the reading process than those who merely answer teacher-generated questions (Singer & Donlon, 1982). Furthermore, asking self-generated questions helps the reader to pay selective attention in reading specific paragraphs and to integrate information across the texts/passages read. In addition, the level of questions asked enable pupils to build knowledge structures from text. Research positively indicates that instructing pupils in generating questions on narrative and informational texts impacts positively on reading comprehension (Palinscar & Brown, 1984; Raphael & Pearson, 1985; Rosenshine Meister & Chapman, 1996). The reader as *assembler* suggests that comprehension occurs at the micro level where the pupil employs a grammatical interpretation of the information contained in the text and a macro level where the reader processes and transforms the text into knowledge (Kintsch, 1998). The reader as *responder* occurs when the reader assesses the accuracy, believability, currency, trustworthiness, depth, authority and the author motive in order to corroborate and integrate information across multiple sources (Smagorinsky & O'Donnell-Allen, 2000).

Traditionally, reading comprehension was considered 'un-teachable' (Duffy, Roehler, & Mason 1984) but given the range of skills required in *building*, *fixing*, *assembling* and *responding* as outlined above, it is now widely accepted that explicit teaching of reading comprehension strategies is beneficial. Furthermore, since reading is a complex process and varies as a function of the interaction among reader, text, and task factors (Catts & Kamhi, 2017) – it requires a 'multi-componential response' (Pressley 2000: 557). However, comprehension remains largely untaught in classrooms internationally (Durkin 1978; Morris 1986; Pressley 2002) and in Ireland (Concannon-Gibney and Murphy 2012; Eivers et al., 2005, 2010). In an evaluation of Curriculum Implementation in Primary Schools (DES, 2005) it was reported that the teaching of reading presented difficulties in a quarter of the class settings inspected. While in most classes, word identification strategies were developed very effectively, apparent difficulties related to practices such as mechanical reading of texts and a lack of variety in the reading material provided. In addition, there was a lack of emphasis on higher-order questioning or on the use of reading material as a stimulus for discussion and analysis.

Findings from a study by McPhillips & Shevlin (2009), which examined special provision for pupils with dyslexia reveal that there exists a skills-based, bottom-up approach to developing literacy skills with teachers placing a strong emphasis on teaching phonics, spelling and word identification skills resulting in the predominant emphasis being placed on developing literacy skills at word level rather than at a comprehension level. In a more recent study which examined how teachers ($n=400$) teach comprehension skills, Concannon-Gibney and Murphy (2012) claim that despite widespread recognition of the importance of developing pupils' literacy skills and in particular the development of metacognitive reading comprehension strategies, findings reveal that teachers rely heavily on decoding instruction while explicit comprehension instruction is not practiced as a rule. The research points to the fact that teachers' beliefs regarding reading comprehension

belong in the main in the traditional mode with an imbalance in the strategies taught at junior class level. In addition, there was a clear dominance of teaching word attack skills over comprehension strategies, while in the senior classes the emphasis shifted to reading for pleasure, however, teaching comprehension strategies was still lacking at this level.

In turn, this emphasis on word level reading is reflected in pupils' performance on assessments. In a study by Morgan and Martin (1995), there is substantial evidence that while Irish pupils perform relatively well on tests of basic reading skills, they perform less well on tests of higher order abilities such as evaluation and critical thinking which are fundamental to reading comprehension. This lack of ability in evaluating is again highlighted in a report by Eivers, Shiel, Perkins and Cosgrove (2005) which examined the reading performance of first and fifth class pupils using TARA Reading Processes which examined reading ability in relation to pupils' ability to *Retrieve*, *Infer*, and *Examine and Evaluate*. Findings reveal that while most (hearing) first class pupils can retrieve and infer information from what they read, and can perform some basic interpretation of texts, fifth class pupils scored highest in retrieving and lowest in evaluating, pointing to the complexity of the reading task.

It is evident that while explicit teaching of comprehension skills is important it remains an area that is under-developed. In keeping with the model of effective comprehension strategies advised by Pearson and Gallagher (1983), the NCCA advise on the gradual release of responsibility with the teacher initially taking responsibility to teach and model key comprehension strategies, moving on to shared and collaborative engagement, to finally pupils becoming independent in applying the strategies against their own schema (Anderson & Pearson, 1984; Narvaez, 2002) or world knowledge (Fletcher, 1994). Underlying all of this is the assumption that strong language skills are a prerequisite for comprehension. The NCCA have recently launched a new integrated curriculum for language from infants to second class to commence in 2018 where the reciprocal nature between (oral) language development and reading comprehension, often across multiple languages, is acknowledged. There are subsequently a number of progression milestones relating to comprehension. The curriculum notes, for example, that by second class, children should be able to use a range of comprehension strategies to engage with various texts.

While literacy is a topic of much interest and debate in deaf education literature, much less is known about class teachers' experiences of or approaches to assessing DHH students. Recent research by Douglas et al. (2012) explored policies and practices, both nationally and internationally, in relation to how teachers measure outcomes in relation to academic progress, independence and well-being. Findings reveal that collating a more comprehensive picture of progress with respect to pupils with a broad range of special educational needs remains problematic, both here and internationally. In relation to pupils who are DHH, the review reports that seventeen teachers reported that they had experience of working with this cohort. Of these, 11 stated that adaptations to the assessment process included: one to one assessments, extra time allocation, the teacher using amplification in the classroom, and use of Lámh, PECS, board marker symbols and photographs to facilitate the assessment of pupils who were DHHAs such, there are often additional considerations needed in the assessment of pupils who are DHH.

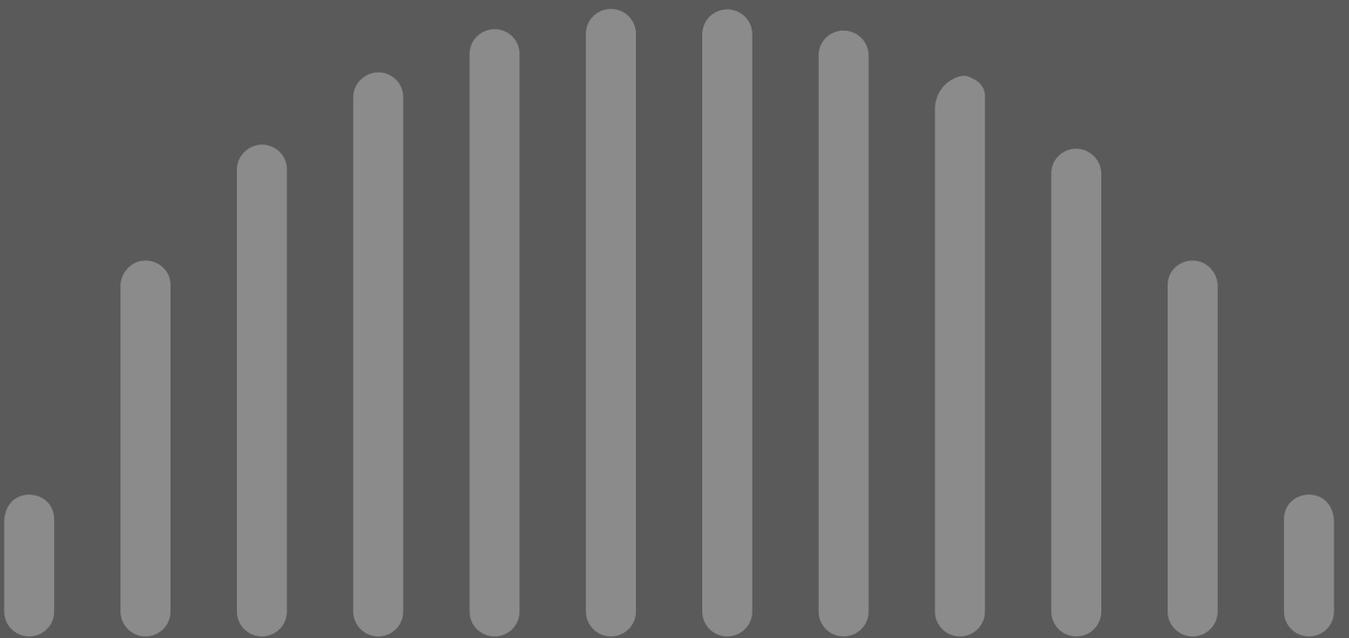
This is understandable since assessment of literacy may present difficulties for mainstream teachers when they are working with pupils who are DHH. Some tests may be inappropriate, pupils may be exempt from standardised testing, or pupils may be reading below the level of standardised tests. In their study on the perspectives of deaf education practitioners on reading comprehension, Swanwick and colleagues note that research "has not traditionally involved the people who are in a position to make a difference" (Swanwick et al., 2012, p. 103). Subsequently they call on researchers to "engage and interact with current practices and the stakeholders concerned" (Swanwick et al., 2012, p. 104). Their study involved focus group interviews with 32 educational professionals including communication support workers, teachers of the deaf (both school based and peripatetic) and deaf instructors. Their study did not, however, include mainstream class teachers working with DHH pupils. All teachers of the deaf in their study were those who had additional qualifications for working with DHH pupils. This is an important distinction. In Ireland, the majority of DHH pupils are placed in mainstream classrooms where they are taught by a class teacher who is very unlikely to have any background in deaf education. DHH pupils in mainstream may receive additional Special Education Teaching (SET) in their school with teachers who may have an additional qualification in special education, but may not necessarily have had any input on deaf education. These pupils in mainstream will also have access to the Visiting Teacher Service who may provide information and support to class teachers and SETs, but these visits are infrequent owing to the large workloads of visiting teachers (McCracken & McLinden, 2014). Subsequently,

responsibility for monitoring DHH pupils' progress rests largely with mainstream class teachers, thus it was this cohort recruited for interviews as part of this study.

Conclusion

In conclusion, recent advances in early screening, identification and intervention with young DHH pupils, coupled with advances in technological developments such as bilateral cochlear implants mean that the landscape for language and literacy development for DHH pupils is changing rapidly, but the results in general terms may not yet be as promising as initially hoped. Historic underachievement of DHH pupils, resulting in increasing gaps in reading achievement between them and their hearing peers as they progress through schooling, and complex and inter-related difficulties in literacy are all evident in the literature. While more promising results have started to emerge, there is, as of yet, no evidence that the gap has been closed, in particular as children get older. The current cohort of primary school pupils aged 7 and up was born in 2010 or earlier. This is an important consideration for this research since in 2013, Universal Newborn Hearing Screening (UNHS) was introduced in Ireland. As a result, literacy outcomes may need to be re-examined for the cohort of DHH pupils both in 2013 and later. Nonetheless, the current study provides a valuable benchmark against which improvements in literacy outcomes could be measured.

METHODOLOGY



Study Design

The focus of this study was to explore teachers' views on how progress in reading was assessed and monitored for pupils who are DHH in mainstream school settings. In addition, the study sought to establish current levels of reading ability for the sample ($n=40$) pupils. Given the different nature of these two queries, one relying on teachers' nuanced reporting of their experiences and one relying on student-completion of standardised tests, this study employed a mixed-methods design using both qualitative and quantitative approaches.

Sampling

Obtaining a sample for this project proved problematic. Initially, a multi-staged sampling procedure was designed to select the sample of pupils. The first stage involved a stratified random sample. The catchment areas of visiting teachers were grouped into four categories representing distinctive regions in service provision for DHH pupils. These categories were devised to try and draw a sample of pupils from mainstream schools across different types of service provision zones. This was to ensure that the sample captured both those pupils enrolled in mainstream schools in spite of a specialist provision for DHH locally, and those pupils who were enrolled in mainstream schools where there were no services for DHH locally, since these two populations may be distinct. There are 41 areas listed on the Department of Education and Skills website with contact details for the visiting teacher service. The researchers categorised the areas as follows:

Zone 1 – caseloads in Dublin (9 areas)

Zone 2 – caseloads in counties with a school/unit for DHH pupils in an urban area (9 areas)

Zone 3 – caseloads in counties with a school/unit for DHH pupils in a rural area (2 areas)

Zone 4 – caseloads in counties with no school/unit for DHH pupils (21 areas).

One area was chosen randomly from zones 1, 2 and 3, and two were chosen from zone 4. The visiting teacher listed for each of these areas was contacted and requested to provide the list of mainstream primary schools where DHH pupils aged seven and older who were on their active caseload were enrolled.

When visiting teachers returned this information, it became apparent that the areas listed on the Department of Education and Skills website did not correspond directly with the caseloads of visiting teachers in practice. For example, teachers may have been listed to work within a particular area (usually a county), but their caseload spanned neighbouring counties. Owing to time constraints and respecting the goodwill of those visiting teachers who had obliged us with the information on their caseloads, we proceeded with this sample. It was largely representative of the areas we had initially selected and spanned 13 counties. The visiting teachers provided details of 43 schools in category 1, 11 schools in category 2, 15 schools in category 3, and 44 schools in category 4. The variation in school numbers might reflect differences in visiting teacher caseloads or the criteria visiting teachers used when returning school details¹.

In the second stage of the original sampling design, quota sampling was used. Initial letters were sent to the principals of all of those schools provided by visiting teachers to request information on the enrolment of these pupils i.e. what class they were in. Consent packs were forwarded to the schools with relevant information for parents and class teachers. Quota sampling was intended to be used until 20 pupils between first and second class, 20 pupils between third and fourth class, and 20 pupils between fifth and sixth class were reached. However, it became apparent in the second stage of sampling that a satisfactory sample would not be obtained. While 113 schools were contacted in the initial mailing with follow-up requests sent to all schools on the mailing list, only 37 schools returned their signed consent for the school to take part (return rate of 33%), and of those 37 schools, parental consent was returned for 17 families. This represents an overall return rate of 15%. Return rates for research in deaf education are often higher than this, in particular when recruitment is done through specialist services (schools, classes or other services specifically for deaf

¹ It became apparent, for example, that some visiting teachers sent on details of schools where pupils who had unilateral deafness were enrolled. Typically, these pupils are not on the active caseload of the visiting teacher, yet some teachers have pupils in this category on their active lists.

children). In Powers' (2003) study, data collected in 1995 yielded a return rate of 47% which increased to 58% in 1996. More recently, Hintermair, Sarimski and Lang (2017) yielded a return rate of 45.3% when parents were recruited through specialist early intervention services. It may be that the nature of mainstream services leads to the lower return rate in this study, or the fact that recruitment of individual families to this project happened in a number of stages (by receiving school consent first, and then having schools pass on information to parents) thus increasing the number of opportunities where participants might be 'lost'.

Generating the 17 families in the initial sampling strategy took over 12 months owing to delays in obtaining permission to contact visiting teachers. The study was taking place at a time of great change for the visiting teacher service. The initial sampling was taking place after the announcement that the visiting teacher service would move under the National Council for Special Education but before that move actually took place. As a result, the service was between two management structures while we were trying to secure their cooperation. Owing to this and the low return rate from the initial sampling design, and to ensure an adequate sample size within the timeframe of the study, the sampling strategy then changed to allow for parents or schools from across the country, who met the study criteria and were interested, to volunteer for the study. Information was posted on social media sites and through organisations for DHH children and their families to advertise the study, and parents or schools who were interested made contact with the researchers. Participants were provided with plain language statements and informed consent forms. This returned an additional 28 potential participants for the study, with 6 schools and 22 parents coming forward. This would suggest that the most successful sampling strategy (in terms of speed and number of responses) for studies of this nature is to seek parents to volunteer for the study. This brings with it a level of self-selection bias and limitations to the generalisability of the findings which will be discussed in the concluding chapter.

As a precautionary measure, a series of Independent Samples *t*-Tests² were conducted to check whether the two methods of sampling used to recruit the families in the research project acted as a predictive factor in the child's test scores (scores will be further discussed in the results section). In other words, we checked to see if there was a significant difference between those who voluntarily contacted the researchers to take part in the study and those who were responding to a call through their school. There were no statistically significant differences in students' scores in the NWRT between those who volunteered individually ($m=111.6$, $SD=22.2$) and those who volunteered through their school ($m=109.6$, $SD=17.8$); $t(38) = -0.322$, $p = 0.749$. Similarly, there were no significant differences in students' scores in the ERT between those participating voluntarily ($m=93.7$, $SD=14.9$) and those being randomly selected to participate ($m=91.1$, $SD=14.9$); $t(33) = -0.517$, $p = 0.608$. Thus, we can conclude that the two sampling methods used did not produce markedly different samples. This may be due to the fact that, regardless of the method used, there was a component of self-selection across both samples and the bias ordinarily associated with self-selection is present in both samples.

The Participants

Forty-eight families returned documentation for the study with 46 families completing the consent process for their child(ren) to take part – one family provided consent for two children, siblings. Two children from the original 48 families were deemed to be unsuitable for the study by their school principals due to the presence of additional needs other than deafness and their view that deafness was the secondary condition. Incidentally, both of these children were from households using a language other than English (Slovakian and Polish) and while both families returned a questionnaire, neither completed the consent form. Another family withdrew consent for the study before their child was tested. This left a total of 45 families who completed questionnaires (primarily mothers who comprised 93% of respondents) about 46 children and of these, 40 pupils completed the tests. In one case, the child did not consent to be tested and in the remaining 5 cases, the schools did not return consent for the study to go ahead. In the case of the family with siblings, separate questionnaire data was collected on each child, but demographic data on the family is only reported once.

² Owing to the fact that the NWRT data is not normally distributed, this finding was checked with the non-parametric test (the Mann-Whitney-U) and the same conclusion was drawn.

Fourteen class teachers were interviewed. As this research project spanned two school years, every effort was made to interview the class teacher who had worked with the pupil in question for at least one school term. As a result, some class teachers who were interviewed no longer taught the child in question but had taught them for the previous school year. Other class teachers interviewed had taught the child for one school term (i.e. from September to December 2016).

The forty pupils tested attended forty different schools. Three schools were under Church of Ireland patronage, one was a multi-denominational school and the remaining 36 were schools under the patronage of the Roman Catholic Church. Four of the schools were single-sex schools with the remaining 36 catering for both boys and girls. The mean school size was 270 pupils, ranging from the smallest school (a two-teacher school with 26 pupils) to the largest, a school with 1,002 enrolled. As such, a wide variety of schools was represented in this study.

Data Collection Instruments

This project sought to answer two main questions:

1. What are the current reading outcomes for a sample of DHH pupils in primary mainstream schools?

In particular

a) is there a gap between particular sub-skills involved in reading (phonological decoding and reading comprehension)?

b) what factors are related to better reading skills?

and,

2. How is progress in reading for DHH pupils measured by teachers?

To answer the first of these, information on existing standardised test results was obtained from school records (where available) on the day of testing. Furthermore, children were tested using the Edinburgh Reading Test (ERT) and the Nonword Reading Test (NWRT), both administered during the study. Both tests were delivered by a research assistant (RA) on this project. She was a qualified primary school teacher with additional postgraduate qualifications in psychology and deaf education and had over thirty years' experience with DHH children. She had specific experience in testing DHH pupils and was very familiar with the ERT. She had not used the NWRT before this study – details on how this was remedied are presented below. Further analysis involved comparing the results of the ERT and the NWRT and bivariate analysis using background demographic data gathered via a parent-completed survey (see Appendix 2) and the child's literacy results.

To answer question 2, semi-structured interviews were carried out with a sample of class teachers. The interview schedule for these teachers is included in Appendix 1. A pilot interview was carried out to check for clarity of the questions. As well as this, the interview schedule was shared with an independent academic with expertise in qualitative data analysis and experienced in interviewing teachers. Some minor amendments to the schedule were made on foot of recommendations from the pilot-interviewee and the independent expert, such as adding a direction at the start of the interview that responses were to be specific to the DHH child in the study, rather than reflective of general classroom practice. The interviews were conducted over the phone, audio recorded, and transcribed.

Edinburgh Reading Test (ERT)

The Edinburgh Reading Test (ERT) (University of Edinburgh, 2002a, 2002b, 2002c) is a standardised test assessing a range of skills relating to reading comprehension. It was produced by the Educational Assessment Unit at the University of Edinburgh. The third edition of level 1 and the fourth edition of levels 2 and 3 were used in this study. While four levels of this test are available, for the purposes of this study, the ERT levels 1, 2 and 3 were used. Level 4 is typically used with pupils at post-primary level. Level 1 is standardised for pupils

between the ages 7:0 to 9:0, level 2 for pupils between the ages of 8:6 to 10:6, and level 3 for pupils between the ages of 10:0 to 12:6. Some pupils outside of the age range of level 3 were included in this study. They were assessed using level 3 and although standard scores could not be generated, reading ages could.

There are four subsections on each level of the ERT, though these differ across levels. They are summarised in Table 3.1 below. The test is administered in two sections, with a short break after subtest B. While the ERT is usually administered in class groups, for the purposes of this research, it was administered individually. The test is not under a strict time constraint and as such, pupils can complete it at their own pace. Instructions for completing the test were explained verbally at the beginning of each subtest, and each subtest contained practice items which were completed together with the tester to ensure the pupil understood what was required. Following this each pupil completed the subtest independently. If pupils skipped questions or finished very quickly, they were encouraged to check back through their answers.

Table 3.1 Subtests on the Edinburgh Reading Tests

	Subtest A	Subtest B	Subtest C	Subtest D
ERT 1	Vocabulary	Syntax	Sequences	Comprehension
ERT 2	Vocabulary	Comprehension of Sequences	Use of Context	Comprehension of Main Ideas
ERT 3	Sequences	Facts & Main Ideas	Points of View	Vocabulary

The tests were scored by the RA on the day of the test and reading ages and standard scores were calculated.

Nonword Reading Test (NWRT)

The UK edition of the Nonword Reading Test (NWRT) (Crumpler & McCarty, 2004), which takes less than 10 minutes to administer was used in this study. This test is used to ascertain phonological decoding by presenting pupils with a range of nonsense words of increasing complexity. By presenting pupils with nonsense words (e.g. teemlith, phloost) they must use phonological decoding skills rather than sight recognition to read the nonwords. The raw scores on the test can be converted to standard scores and used to provide a phonological decoding reading age. The test is appropriate for pupils aged between six and 16 years.

The tester was not familiar with the NWRT prior to carrying out this research project. In order to assure the validity of the inferences made based on test results, an audio recording of the nonsense words being read correctly (as per the test manual) was provided to the tester so she could familiarise herself with the correct responses for each test item. A pilot test was also carried out, following which a decision was made that audio recording the child completing the NWRT was necessary to ensure accuracy of scoring. The recording was used only to facilitate the scoring of the test and deleted immediately afterwards. Parental and school consent was given for the audio recording.

While the manual warns against the use of this assessment with pupils who are DHH, it was used in this study since all of the pupils were in full mainstream placements and using speech and listening to access the literacy curriculum. This test presented the opportunity to isolate phonological awareness and decoding skills and to explore if pupils' scores in these domains were commensurate with their levels of reading comprehension.

Data Analysis

Quantitative data were analysed using the software package Statistical Package for the Social Sciences (SPSS) version 23. All scoring was double checked by a second RA prior to data input and analysis. Some minor errors were corrected. Data cleaning was carried out prior to analysis. Simple descriptive statistics were used in the preliminary stages of analysis to produce summarising data on the characteristics of participants. The dependent variables (ERT and NWRP scores) were first analysed using univariate statistical analysis to examine central tendency (means or medians) and dispersion (standard deviation and range). The raw scores from each test were converted into standardised scores, allowing us to compare the results of the pupils tested with a larger sample of hearing pupils (in the case of the NWRP and the ERT this sample of hearing pupils are drawn from the UK) and to compare individual pupils' performance across different tests. Since standardised scores are relative to a sample of children the same age as the pupil being tested, it is possible to compare standard scores of children across ages. For example, a 7 year old with a standard score of 115 is doing better, relative to their hearing peers, than an 11 year old with a standard score of 100, although the 11 year old may be able to read to a higher level than the 7 year old. Standardised scores have a mean of 100 and a standard deviation of 15. Scores are interpreted as follows:

<85 = below average

85-115 = average

>115 = above average

Relationships between the independent variables gathered on the parent questionnaires and the dependent variables were examined using bivariate analysis techniques including Pearson correlations, Spearman's rho (correlation coefficient), and Independent Samples *t*-Tests. Correlation coefficient scores were interpreted using the guidelines put forward by (Connolly, 2007, p. 95) as follows:

<0.3 = weak

0.3-0.6 = moderate

>0.6 = strong

Tests of normality were used to ascertain whether parametric tests were feasible in bivariate analyses. Where data were not normally distributed, both parametric *and* non-parametric tests were used to corroborate findings. Where different results were returned, results of the non-parametric tests are reported. Independent variables were in three categories: family-level, child-level and study-level variables. Details on individual tests used and the corresponding results are presented in the next chapter. The independent and dependent variables from the bivariate analysis are listed in Table 3.2 below.

Table 3.2 Independent and dependent variables from the study.

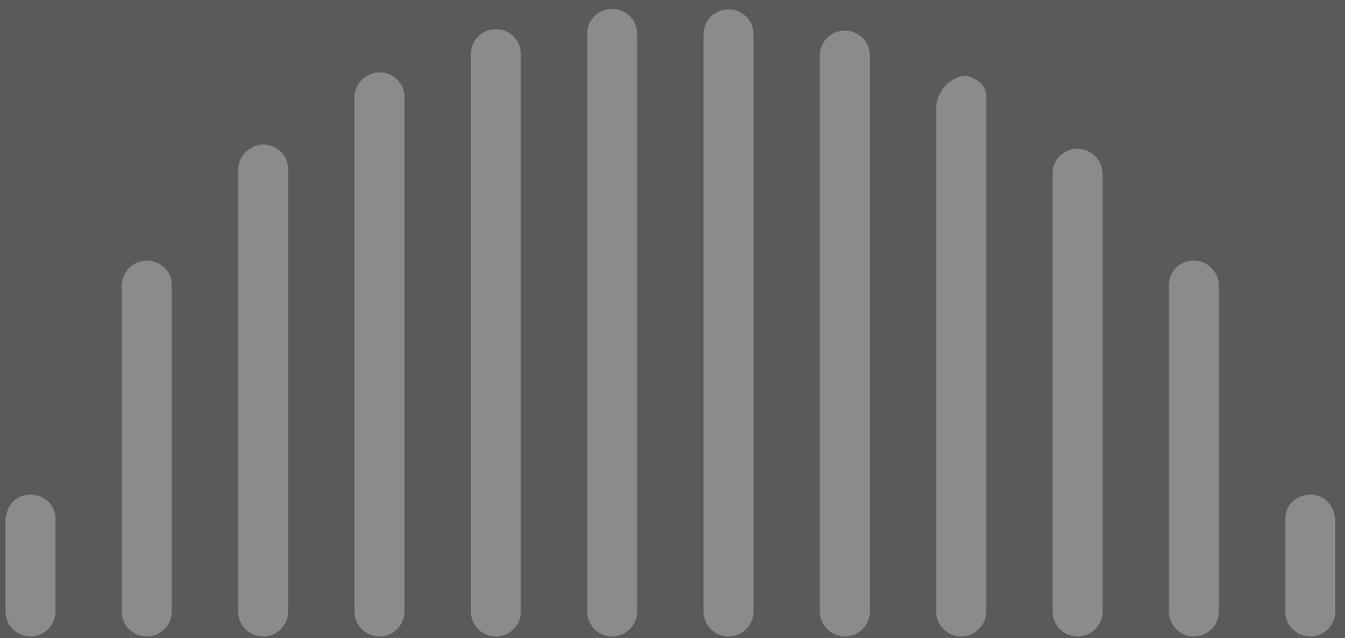
	Independent variables	Dependent variables
Family-level	Parental Age	Edinburgh Reading Test Scores Nonword Reading Test Scores
	Parental hearing status	
	Parental education level	
	Household income	
	Time devoted to language activities in the home	
Child-level	Level of deafness	
	Use of hearing aid/cochlear implant	
	Gender	
	Class grouping (eg 1 st – 6 th class)	
	Prior standardised test results	
Study-level	How participants were recruited for the study	

The semi-structured interviews were transcribed for coding and analysis using the software package NVivo. A three stage process of analysis was carried out using techniques such as open coding, categorisation of codes and data reduction as outlined by Miles and Huberman (1984). The first stage involved organising the interview transcripts into categories based on responses to the structured questions used during the interview. This stage created 12 categories. In the second stage, open coding was used within each of these categories to find recurring themes. Individual units of meaning within each theme were identified and coded. This resulted in 35 codes being generated under the 12 categories. Stage 3 involved reducing the data in these 35 codes to 6 final overarching themes to make sense of the data as a whole. Following this step, the 6 themes were further-collapsed into three main themes to represent the main ideas that emerged from the qualitative data.

Ethics

The study was approved by the Research Ethics Committee in St Patrick's College, Drumcondra and all ethical standard procedures were adhered in this study. Plain language statements outlining the focus and aim of the study were provided to all participants including principals, boards of management, class teachers, parents, and an adapted plain language statement in simple English for the child participants. The child participants had the plain language statement read to them by the RA completing the testing. All participants provided informed consent in writing (ascent in the case of child participants). In order for testing to proceed, permission had to be sought from all participants. In the case of one child, all adult participants had consented, but the child did not want to be tested, and thus was excluded from the study. One parent and one teacher requested to withdraw from the study. The right to withdraw from the study was upheld.

RESULTS



Introduction

In this chapter we present the findings from our data collection. We begin by outlining demographic characteristics of the families who took part in the study from data collected on the questionnaires. Using the same data, we also provide data on the language and literacy practices within homes. We follow this with a description of the children's performance on both tests, first in general terms among the sample of 40 and then by class groupings. An analysis of the relationship between test scores and a host of independent variables is then presented. This chapter concludes with the qualitative data collected during teacher interviews about their experience of assessing progress in literacy.

About the Families

In this section, we present some background information about the families whose children were included in the study³. Forty-five families returned questionnaires and were deemed suitable for inclusion in the study (one family with two children resulting in 46 completed returns in total). Demographic data for the one family with two DHH siblings was only counted once, so the total number of families represented in the data below is 45.

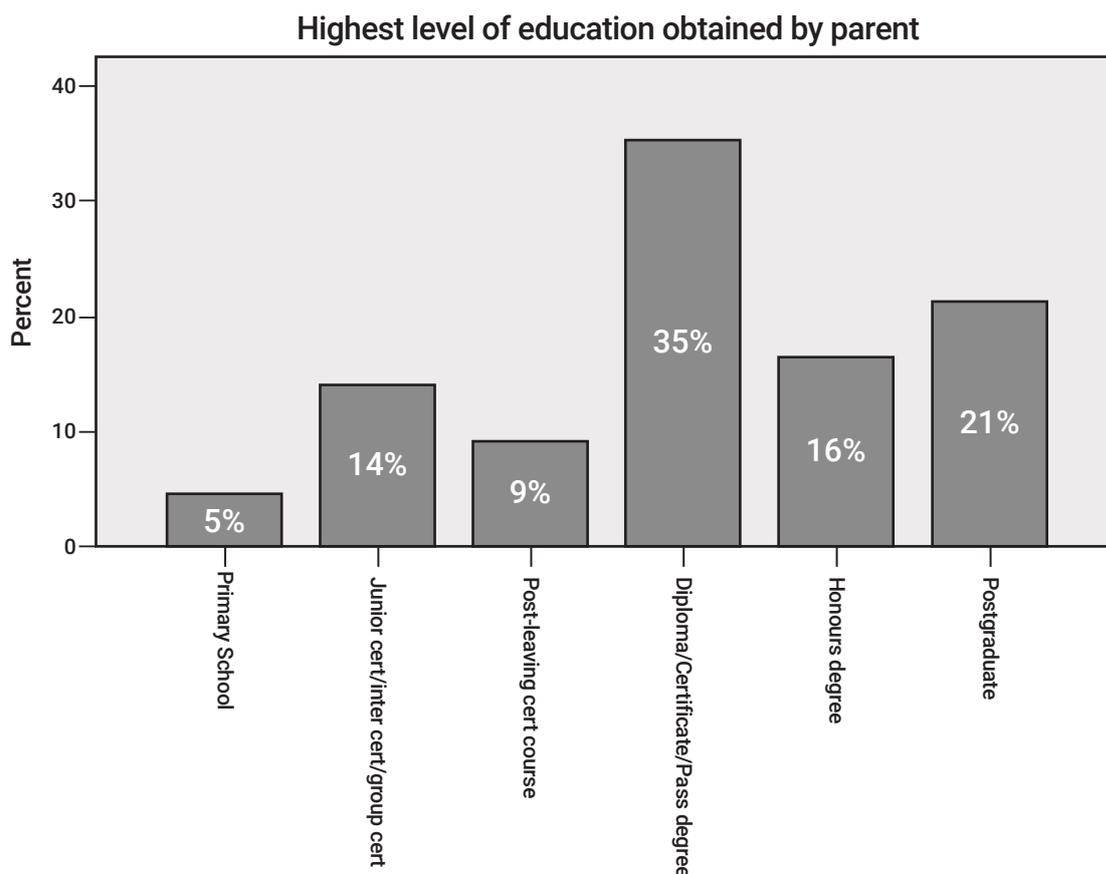
Mostly questionnaires were completed by mothers (93%) in the age category 41-45years. The majority of parents (60%) were hearing but some indicated that they were Deaf (7%) or hard of hearing (26%). As such, DHH parents are over-represented in this study, since it is usually estimated that over 90% of DHH pupils have hearing parents (Mitchell & Karchmer, 2004). However, it would appear that in spite of the high number of DHH parents reported, spoken English was still the dominant language of the study families. Only one family mentioned that they used a language other than English as the main mode of communication in the home, specifying Irish Sign Language as that language. A further two families listed that they also used Irish (Gaeilge) in the home but indicated that English was the main language of the home.

The majority of parents in the study reported that they had completed some form of education beyond secondary school (see Figure 4.1 below). 60% of the sample had completed a post-leaving certificate course or a third level undergraduate qualification. A further 21% had a postgraduate qualification, giving a total of 81% with some form of post-secondary school qualification. Based on the 2016 Census returns, 9.6%⁴ of the population in Ireland as a whole have a postgraduate qualification (Personal communication, Central Statistics Office, 2017), thus, at 21%, parents in this sample were more than twice as likely to have a postgraduate qualification than the national norm, demonstrating that this sample is over-representative of well-educated parents.

3 Valid percentages are used. As such if respondents did not respond to a particular question, they are not counted in the percentage counts. If more than 5% of the sample did not answer a particular question, this is indicated. Percentages are rounded to whole numbers throughout.

4 Percentage calculated based on those over 25 years of age in line with the minimum age of respondents in this sample.

Figure 4.1 Parent Self-Reported Highest Level of Education Obtained⁵



Parents reported a wide range of net household incomes (from below €12,000 to above €96,001 per annum), and there was a statistically significant strong positive correlation between income and education, indicating that the higher the levels of education (of the parent), the higher the net household incomes ($r_s=0.80$, $p<0.001$). Participants were asked to report their net household income in income brackets – the 10 income brackets used in the Growing Up in Ireland survey were given. The median household income bracket reported in this study was €48,001-€60,000, however there were more families in the €60,001-€78,000 bracket than any other bracket (see Table 4.1 below). The national average household disposable income is €47,400 (CSO, 2016). Subsequently, participants in this study appear to be disproportionately from higher income households.

⁵ Note that Leaving Certificate does not appear in the graph above because no respondents indicated that as their highest level of schooling received, perhaps indicating that those who completed the Leaving Certificate proceeded on to further education.

Table 4.1 Parent-Reported Net Annual Household Income

	Frequency	Valid Percent
Under €12,000	2	5%
€12,001-€18,000	1	2%
€18,001-€24,000	4	10%
€24,001-€30,000	3	8%
€30,001-€42,000	6	15%
€42,001-€48,000	2	5%
€48,001-€60,000	6	15%
€60,001-€78,000	8	20%
€78,001-€96,000	4	10%
€96,001 or more	4	10%
Total	40	100.0
Did not respond	5	
Total	45	

Language and Literacy in the Home

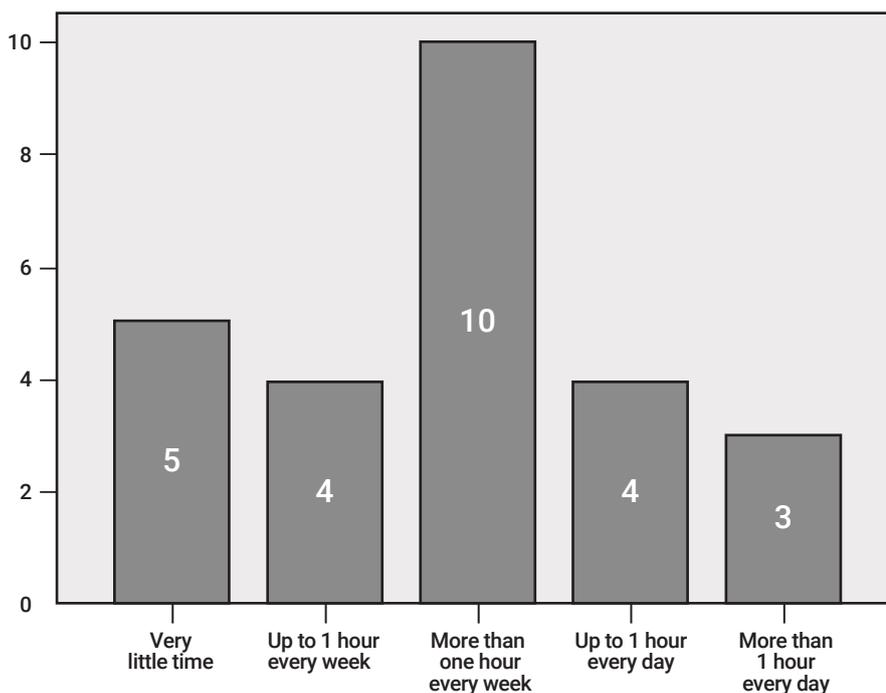
The questionnaire contained a series of questions about language and literacy practices in the participants' homes. The responses are summarised below. For these questions, the family with siblings have both returns included since practices may have varied between the two children.

The majority of pupils in the sample (43%) are still in receipt of speech and language therapy services with many others noting that they received speech and language therapy services in the past but not anymore (37%). Only one child (2%) was reported to be on a waiting list and 8 children (18%) were listed as never having availed of speech and language therapy services. Most of the children in this last category had parents who were DHH and several of them came from lower income households.

A little over half the sample of parents completing the questionnaire (53%) reported that they did activities to support spoken language development at home. The amount of time respondents spent on these activities, varied from 'very little time' (5 parents) to more than an hour every day (3 parents). A summary of the responses to this question is presented in the Figure 4.2 below.

Parents had positive attitudes towards the use of speech generally with all parents (n=45) agreeing that speech was important for their child's social development (100%) and educational development (100%). In addition, the vast majority agreed that their child's class teacher was supportive of spoken language acquisition (98%) and that their child's visiting teacher supported them in using speech with their child (80%).

Figure 4.2 Parent-reported time spent on activities supporting spoken language at home.



Families were questioned as to the extent of use of Irish Sign Language with their children as a means of communication: 2 families (5%) reported that their child uses ISL for communication, 5 (11%) used ISL in the past but not anymore and 36 (84%) never used ISL for communication. This finding is unsurprising given that this sample is drawn from pupils who are in full mainstream programmes where use of ISL is sparse (Mathews, 2018). Respondents were also asked if they were familiar with the ISL Home Tuition grant, since this service is free of charge to all parents regardless of educational placement. Most (72% or 32 parents) were unaware of the existence of the grant while 28% (13 parents) knew of its existence. Of these 13 parents, 2 were still in receipt of the grant, 6 had accessed previously but were not now in receipt, and 5 had never used the grant. Of the 32 parents who reported that they were unfamiliar with the existence of the ISL grant, 2 reported that while their child did not currently use the ISL for communication, they had used ISL in the past. While one pupil had previous support from ISL in school, this was now discontinued. In spite of the low numbers of pupils using ISL in this study, it is still of concern that large numbers of families remain unaware of the ISL tuition grant, given that information about *all* services should be provided to all families.

In contrast to the generally positive views towards spoken language, participants were more mixed in their responses to questions about the benefits of ISL. Overall, fewer parents responded to these questions (because of a filter question directing those who had never used ISL with their child to the next section). Nine participants responded to the question as to whether ISL was beneficial to their child's educational development – 3 *disagreed*, 4 *agreed* and 2 were *unsure*. Seven responded to a similar question about the benefits of ISL to their child's social development; 2 *disagreed*, 4 *agreed* and 1 was *unsure*. Four parents agreed that they had been recommended (at least once) not to use ISL with their child.

Two open questions were presented to parents in this section of the questionnaire. One question asked those parents who reported that their child used ISL in the past, but not anymore, why they had discontinued its use. Their responses were as follows:

My child's spoken language is excellent and understanding is excellent.

My son's dad is deaf so when they were younger a small amount was used e.g. 'milk', 'toilet' etc. Their dad has good speech even though he is profoundly deaf.

*Once (child's name)'s CI started to work well, he was happier to speak.
However, we intend to revisit at some point.*

Our ISL tutor recorded information on three occasions, strongly disagreed with cochlear implants and asked to remove our child's implant - he is an approved and qualified tutor.

Since CI implant-he dropped SL.

We could not develop our ISL as we could not find an ISL tutor in our area.

It is evident that for some parents, spoken language acquisition coincides with a decline in the use of ISL . The actions of the ISL tutor mentioned above (e.g. recording the child and asking for removal of a child's implant) are of considerable concern. It is also regrettable that a family who wanted to develop their child's ISL were unable to do so due to the lack of a tutor in the area.

Parents were also asked to explain how they understood Irish Sign Language. Their responses were as follows:

I believe ISL would benefit (child's name). It was difficult to find a teacher. When he had a good teacher he and I learned but she left due to personal circumstances and we never went back to ISL. He occasionally expresses an interest. ISL is something we really should develop.

Irish Sign Language is a language that should be taught in schools. It has helped enormously in helping our daughter achieve spoken language. We teach our younger child (hearing) ISL and we feel it stops frustration when they don't know the spoken word.

ISL is a method of communication not dependent on any spoken language. It is a full, complex, language in its own right.

ISL is a separate language made by deaf community who some are solely relying on this language, therefore it is important for hearing community to learn so the deaf community are not separated. ISL is hugely effective in aiding developing speech in early years with a deaf child.

ISL is a wonderful communication way for deaf people. It is highly important for the deaf community. It was my son's own choice to drop ISL but maybe he 'll pick it up in the future.

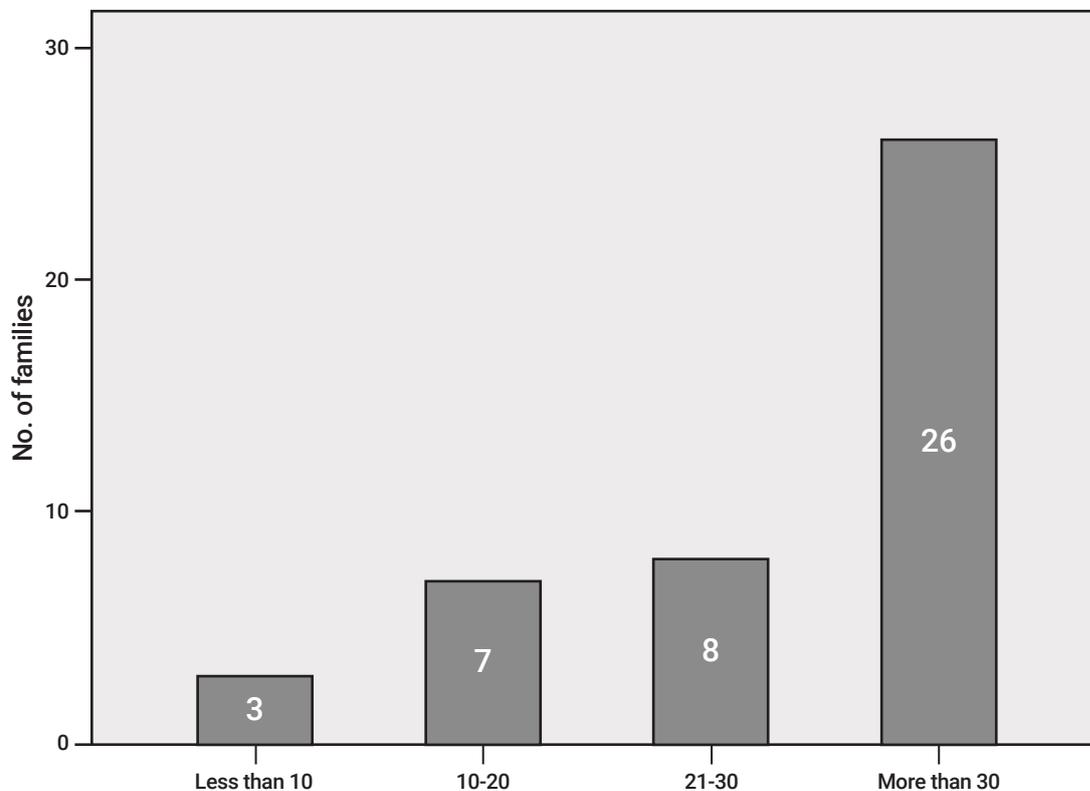
ISL is sign language used by deaf or hard of hearing people in Ireland.

We want to give our daughter options, learning ISL equips her to communicate in the deaf community, also when technology is not on (CI's), she is deaf and needs alternatives.

These responses indicate a nuanced understanding of ISL among several of the parents in this sample, its grammatical structure, its role in the Deaf Community and the potential benefits to spoken language acquisition.

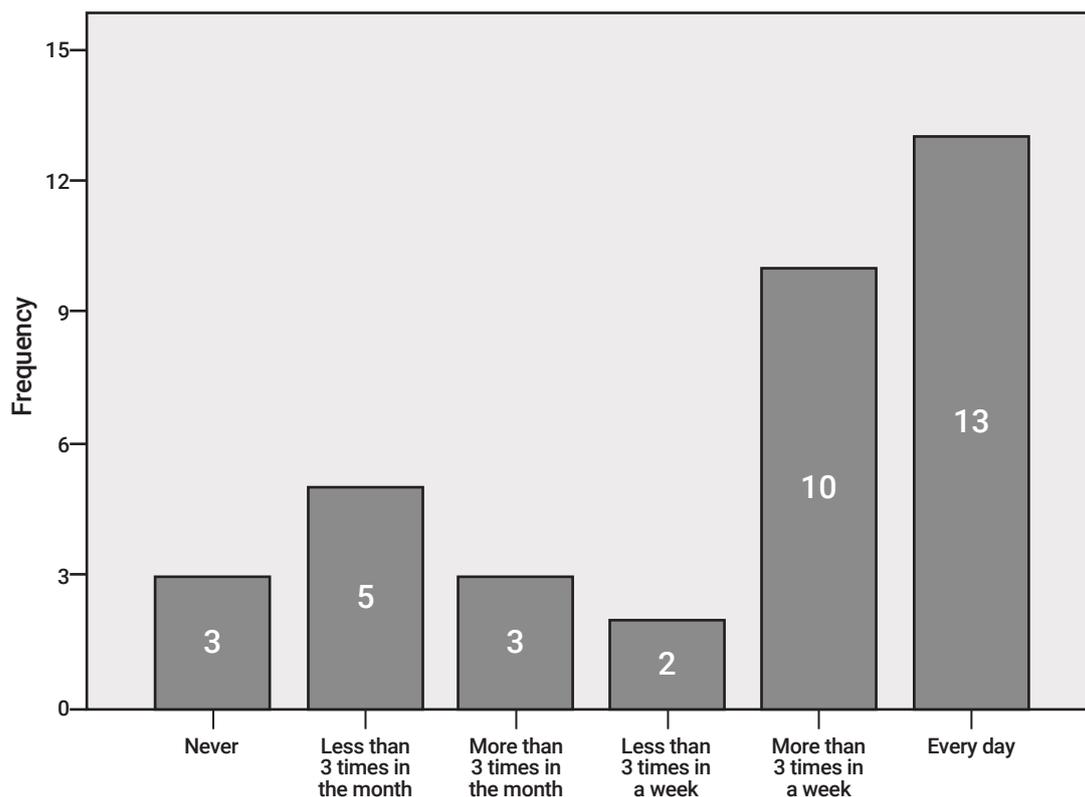
Finally, parents provided information to a range of questions about literacy practices in the home. The responses indicated that the majority of pupils came from homes that are very supportive of literacy practices with the majority of pupils (59% of respondents) having access to more than 30 children's books in the home (figure 4.3).

Figure 4.3 Parental report on the number of books the study child has access to at home.



This is only marginally higher than the national average ascertained in the Growing Up in Ireland survey which found that 56% of the child cohort sample had access to more than 30 children's books at home (Williams et al., 2009). In this study, nearly all parents (96%) agreed that reading was an important activity to do with their child with most parents (78%) reporting that they used the public library and that they were engaged in book sharing activities with their pupils at home. Parents were asked how regularly they read with their child. Responses are detailed in figure 4.4 below and show that more than half of the participants engage in reading activities with their child weekly. Given that some parents noted in the margins of the questionnaire that they no longer read with their child because they are now read independently, high number of those reading weekly or more regularly would indicate a high level of commitment to activities promoting literacy among this sample.

Figure 4.4 Parent reports on regularity of reading with their child in the past month



In response to a series of questions about their experience of reading with their child – their responses are detailed in Table 4.2 below.

Table 4.2 Parental attitudes towards shared reading with their child

	Agree	Unsure	Disagree
	Valid Percent	Valid Percent	Valid Percent
Reading with my child is an enjoyable experience	96%	2%	2%
I feel confident that I can read with my child	98%	2%	-
I feel confident that my child understands me when I read	84%	7%	9%
I find it difficult to read with my child	11%	2%	87%
It is more difficult to read to a deaf child than a hearing child	40%	10%	50%

Overall, table 4.2 demonstrates that parents were positive, confident and at ease about reading with their child. However, many parents (40%) indicated that they felt it was more difficult to read to a deaf child compared with a hearing child, and while parents were confident that they could read to their child (98%), they were less confident that their child understood them when they read (84%).

About the Children

All of the children in this study were recruited from full mainstream placements (from schools that did not have a class for DHH children). In primary school, the curriculum is conceptualised in two year-blocks e.g. Junior and Senior infants, 1st and 2nd class, 3rd and 4th class, 5th and 6th class. Owing to the nature of the tests used in this study, the sample was drawn from children between first and sixth class. A total of 40 children were tested during this study and they were distributed across the class groupings as follows: 14 children in 1st or 2nd class, 14 children in 3rd or 4th class, and 12 children in 5th or 6th class. As such, the distribution across the three groupings of 1st/2nd, 3rd/4th and 5th/6th was fairly even. On the date of testing, children ranged in age from 7 years 3 months to 13 years 3 months. The mean ages of children across class groupings were as follows: 1st/2nd class grouping = 8 years 3 months, 3rd/4th class grouping = 10 years 2 months, 5th/6th class grouping = 12 years 3 months. There were 17 boys and 23 girls in the study. Only children for whom deafness was their primary special education need were recruited for the study (based on selection on the part of visiting teachers and/or schools). All of the children used spoken language as their main mode of communication and were accessing the curriculum through listening and speaking.

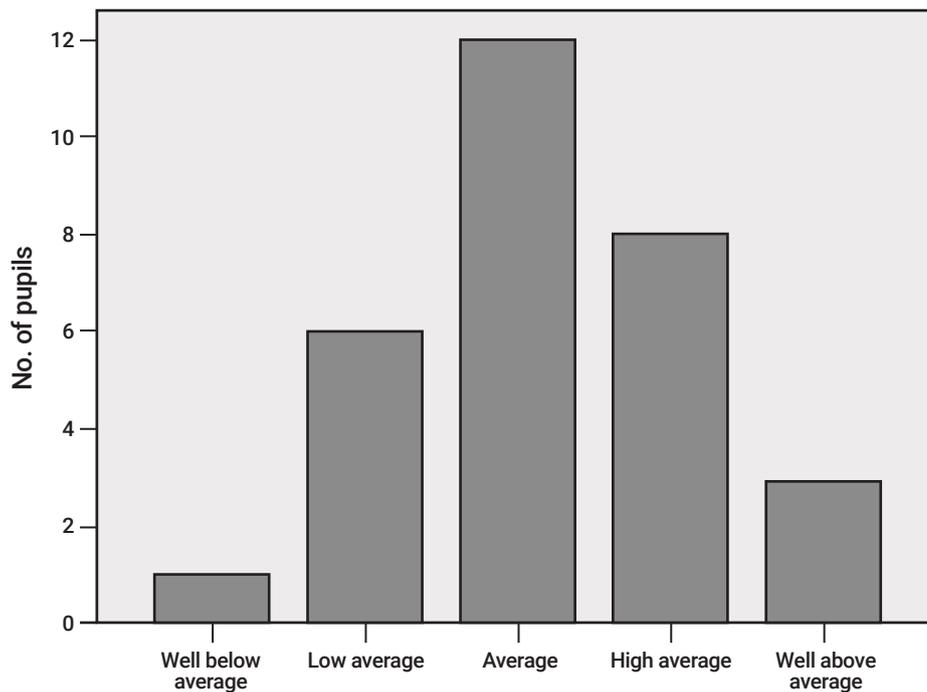
Parents were asked to report their child's hearing loss both qualitatively (using the categories profound/severe/moderate/mild) and in decibel thresholds. Only 3 parents reported decibel thresholds, suggesting that parents may not use these terms to understand their child's deafness. Instead, most parents used qualitative descriptors to describe their child's deafness. In the sample of children tested, 13 children were profoundly deaf, 6 were severely deaf, 15 were moderately deaf, and 2 had mild levels of deafness. Nearly all of the children (37) had bilateral deafness and 3 were reported to have unilateral deafness. None of the schools had audiograms on file for their pupils. Parents reported on hearing aid or cochlear implant use also. In total, 13 children used cochlear implants (6 of these had bilateral implants), 20 used hearing aids and 4 were reported not to use any amplification. A cross-check was done on school records for those children reported by their parents not to use amplification of any kind. Three of the 4 children *had* been fitted with amplification (2 with hearing aids and 1 with a bone anchored hearing aid) but the children would not wear the device. While a small number of children were reported to have mild or unilateral deafness, since they were on the active caseload of the visiting teacher, they were retained in this study.

Reading Test Results

Existing Test Results

For each of the pupils tested, schools were requested to provide any existing reading test results they had on record, in particular results of standardised reading tests. Results were available for 30 of the pupils tested and in each case the result was recorded as a sTen score. They are summarised in figure 4.5 below. In this graph, sTen scores are collapsed into broad qualitative categories as described by the National Council for Curriculum and Assessment (https://www.ncca.ie/media/1400/english_tip_sheet_sten.pdf) for easier interpretation.

Figure 4.5 Existing Reading Scores



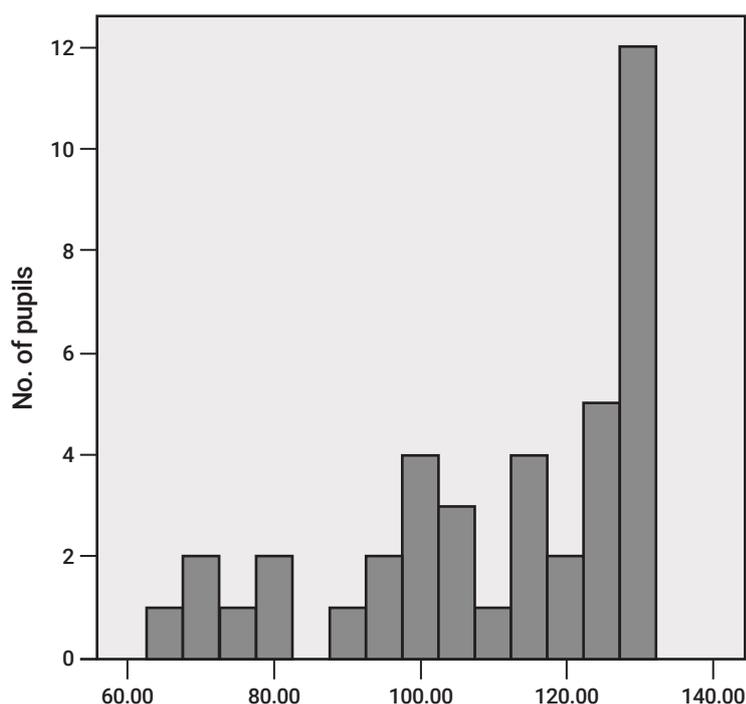
The scores on record for 30 of the pupils tested in the study suggest that they are fairly normally distributed but slightly above average, compared with their hearing peers. This finding is somewhat surprising and may indicate that DHH pupils are generally reading better than expected (if our sample is representative of the national population of DHH pupils), that this sample is biased in some way and therefore this finding is not representative of what is happening nationally, or that there is an issue with the administration of testing. The most likely event (though we cannot be certain), knowing what we do about the higher income and education levels among the parents of this sample, is that the sample itself is biased – this is not particularly unforeseen given the self-selection nature of the sample.

Nonword Reading Test Results

The Nonword Reading Test (NWRT) assesses a child's ability to use their knowledge of letter sounds and blends to read unknown words and to test their phonological decoding.

Forty pupils were tested and standard scores were calculated for all 40 in the NWRT. The results indicate that, in general, the pupils performed well on the NWRT (see Figure 4.6). The NWRT results were tested for normality using the Shapiro-Wilk and were found not to be normally distributed ($p < 0.001$). There was a considerable negative skew in the results of the NWRT, with a high number of pupils (12) achieving the maximum possible score, indicating that these data also suffer from the ceiling effect. This is because the maximum level possible on the NWRT does not capture or distinguish between the ability of those pupils who are beyond that level, creating a 'ceiling' of pupils at standard score 130.

Figure 4.6 Standard Score Results of the Nonword Reading Test

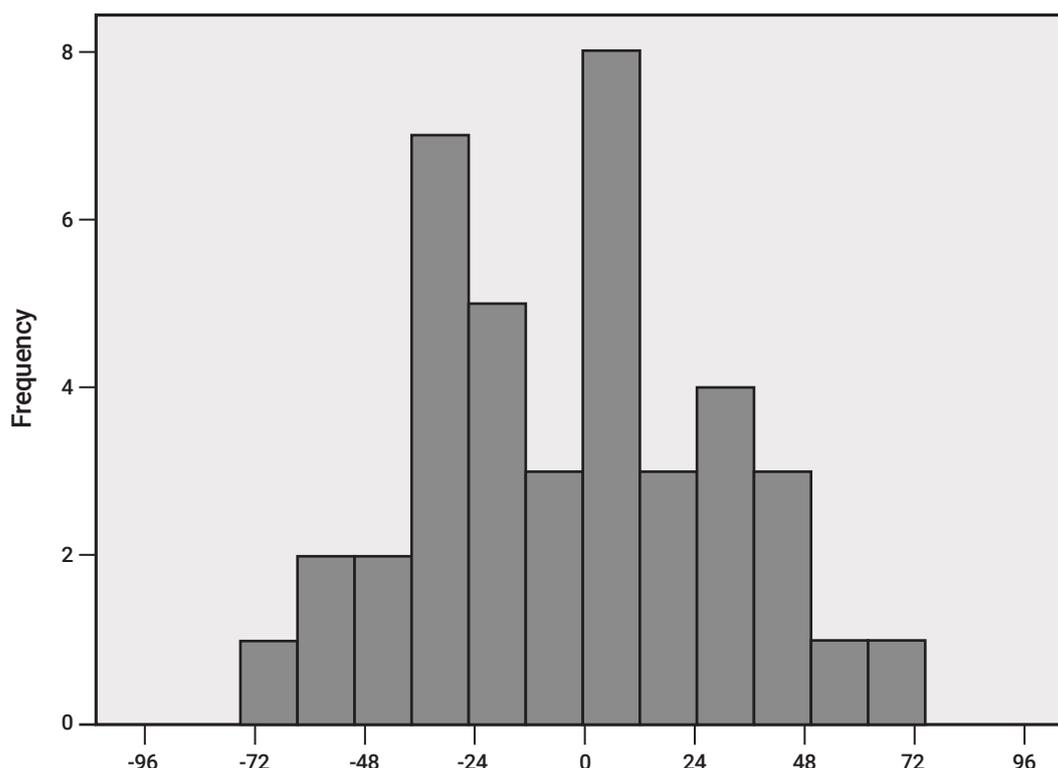


The mean⁶ standard score was 111 (*Mdn* = 116.5) which represents an above-average performance in general for this sample, but the large standard deviation of 20 and range of 65 (Interquartile range = 32) suggests that there is considerable variability in performance on this test. There was a large spread of scores from >130 to <65. These mark the top and bottom thresholds of this particular test indicating that across the 40 pupils tested, the full spectrum of ability on this test was evident. Overall, 15% of the sample scored below average (standard score below 85) on this test with the remainder either scoring within average range (32.5%) or above average (52.5%).

A second way of interpreting these scores is to look at net reading age. This is the difference (either positive or negative) between a child's chronological age and the reading age (sometimes called an age equivalent score) calculated by this test. Reading ages can be problematic if used for statistical analyses but provide a helpful addition to standard scores in interpreting the overall outcome of the test. Furthermore, reading ages are often used in the reporting of DHH pupils' literacy results (see for example Archbold et al., 2008; Geers et al., 2017). The mean net reading age on the NWRT was -1 month and the median was -3 months below chronological age, suggesting overall that pupils are reading fairly close to their chronological age on this test. This is confirmed by a histogram of the net reading ages (in months) for this test in Figure 4.7 below.

⁶ Note that the range of scores for the NWRT is from 65-130. The mean, therefore, cannot take account of pupils who scored in the categories labelled as >130 or <65.

Figure 4.7 Net Reading Ages in Months on the NWRT



The histogram demonstrates that many pupils (11) were reading within 12 months of their chronological age, though the spread of the data shows that some pupils were reading as much as 6 years above or below their chronological age.

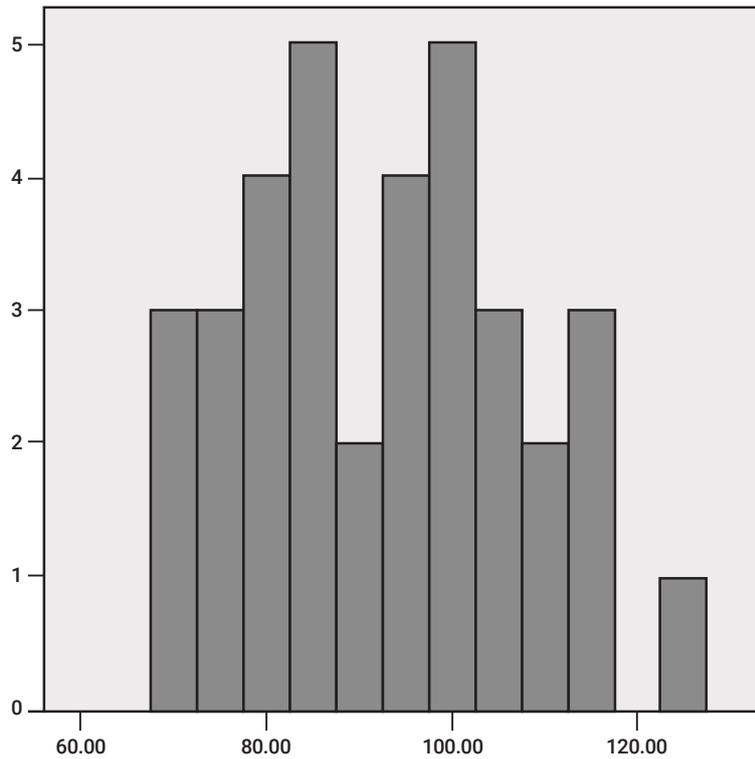
The above average performance in the NWRT may be down to a number of factors. Pupils who are DHH may be in receipt of additional tuition in phonics from their Special Education Teacher (SET) (previously named Resource or Learning Support Teacher) which could contribute to higher scores on this test. Indeed, as we will see below, phonics is an area that many of the class teachers cited as a skill they were teaching and assessing regularly, with many following structured phonics programmes, and several DHH pupils receiving additional support in phonics outside the classroom. As well as this, a number of the pupils commented during the introduction to this test that they were familiar with the concept of nonsense word reading and had 'practised' this type of reading regularly with their SET (though none of them mentioned that they had done this particular test before).

Edinburgh Reading Test Results

Forty pupils were also tested using the ERT. Perhaps owing to the length of this test, and the fact that it is delivered in two sections, some pupils (5) did not complete the test. In instances where it was suspected that the overall score was not indicative of the child's ability (e.g. where a child did not return to attempt part two of the test), these results (2) were excluded. Also, three pupils fell outside the age range of the standardised results, and so no standard score could be calculated for them. However, a reading age was available for these pupils. In total, standard scores could be calculated for 35 pupils and reading ages for 38 pupils.

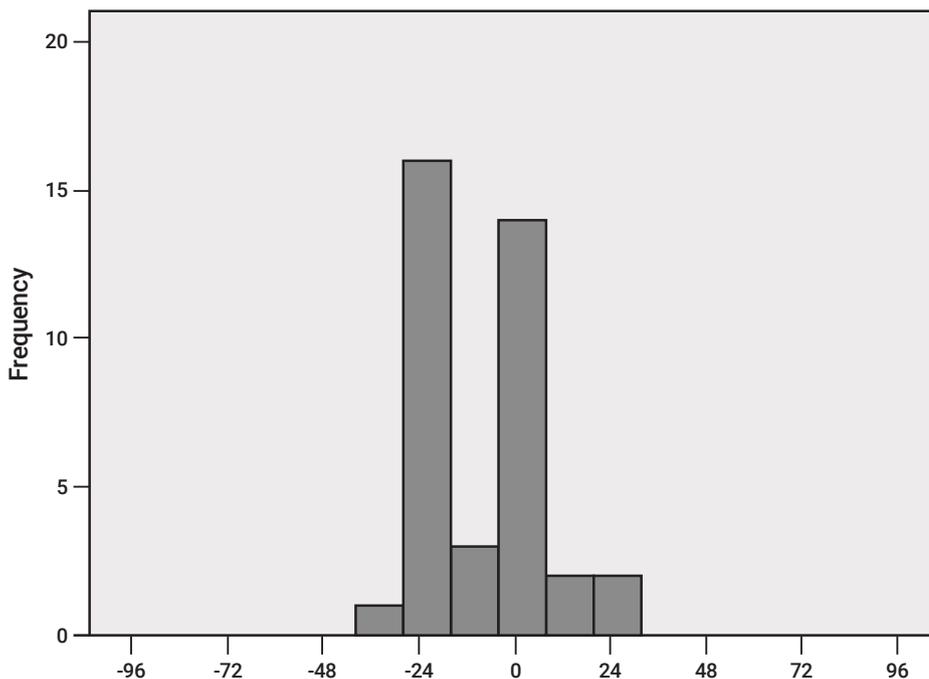
The results of the ERT were tested for normality using the Shapiro-Wilk test and found to be normally distributed ($p=0.438$). A histogram showing the results of standard scores in the ERT is presented in figure 4.8 below. The mean score on the ERT was 92 (Median = 94). Thus, while pupils generally performed less well in this test compared with the NWRT, they were, on average, within the normal range of ability compared with their hearing peers (normal here defined as having a standard score between 85 and 115). A slightly smaller spread was noted compared with the NWRT, with a standard deviation of 15 and a range of 55 (IQR = 23). Like the NWRT, the full spectrum of ability was evident with standard scores ranging from 70 to 125. However, overall performance on the ERT was poorer than on the NWRT with 37% of the sample scoring below average. Over half of the pupils however (54.3%) scored within average range with a further 9% scoring above average.

Figure 4.8 Standard Score Results of the Edinburgh Reading Test



In terms of the average net reading age on the ERT, the mean was -9 months and median -10 months below chronological age. This shows that while pupils performed less well on this test than on the NWRT, they were still, for the most part, reading within a year of their chronological age (figure 4.9). The smaller range in figure 4.7 above compared with figure 4.9 shows that the reading age on the ERT was less spread than on the NWRT (perhaps a factor of the nature of this test), though the positive skew, peaking around - 24months shows that pupils were more likely to be reading below their chronological age on this test than on the NWRT.

Figure 4.9 Net Reading Age Results for the ERT.



The standard scores on both tests were examined in relation to the existing results on record for the 30 pupils whose earlier assessment results were available. A statistically significant positive relationship was found using the Spearman's rho between existing sTen scores (from the Micra-t and the Drumcondra Reading Tests) and both the ERT standard score ($r_s=0.85, p<0.001$) and the NWRT standard score ($r_s=0.46, p=0.010$).

Comparing Phonological Decoding and Comprehending Ability

Since the NWRT and the ERT assess different skill sets in reading, it is interesting to compare the performance of our sample across these two tests. As was noted above, pupils generally performed better on the NWRT than in the ERT. For more convenient reporting, the standard score results were collapsed into qualitative categories. The categories used are in table 4.3 below:

Table 4.3 Qualitative categories for standard scores

Standard score range	Qualitative category
116 or above	Above average
85-115	Average
84 or below	Below average

The results across both tests reported using these qualitative categories are presented in the figures 4.10 and 4.11 below.

Figure 4.10 NWRT results in qualitative categories

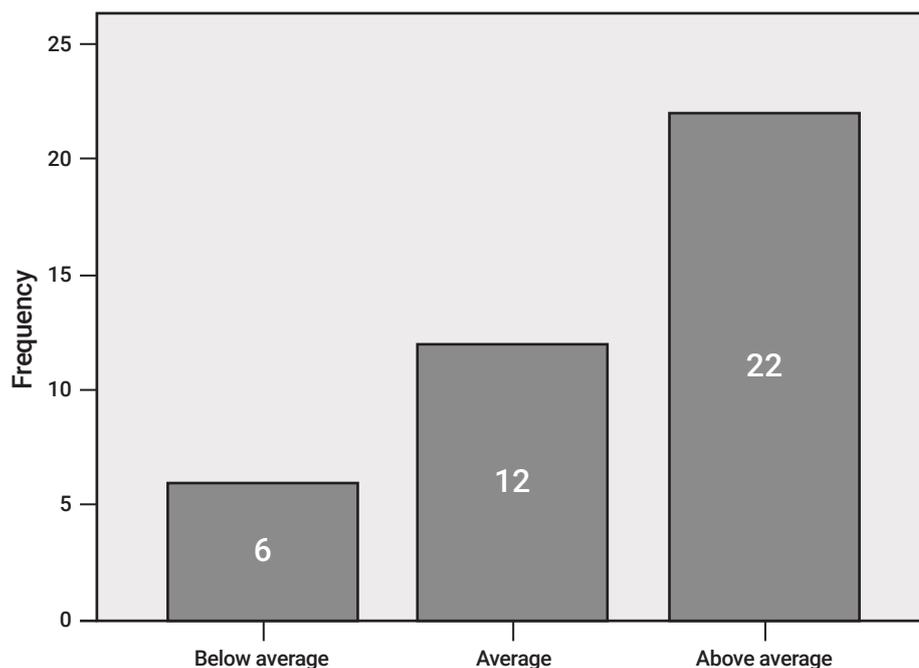
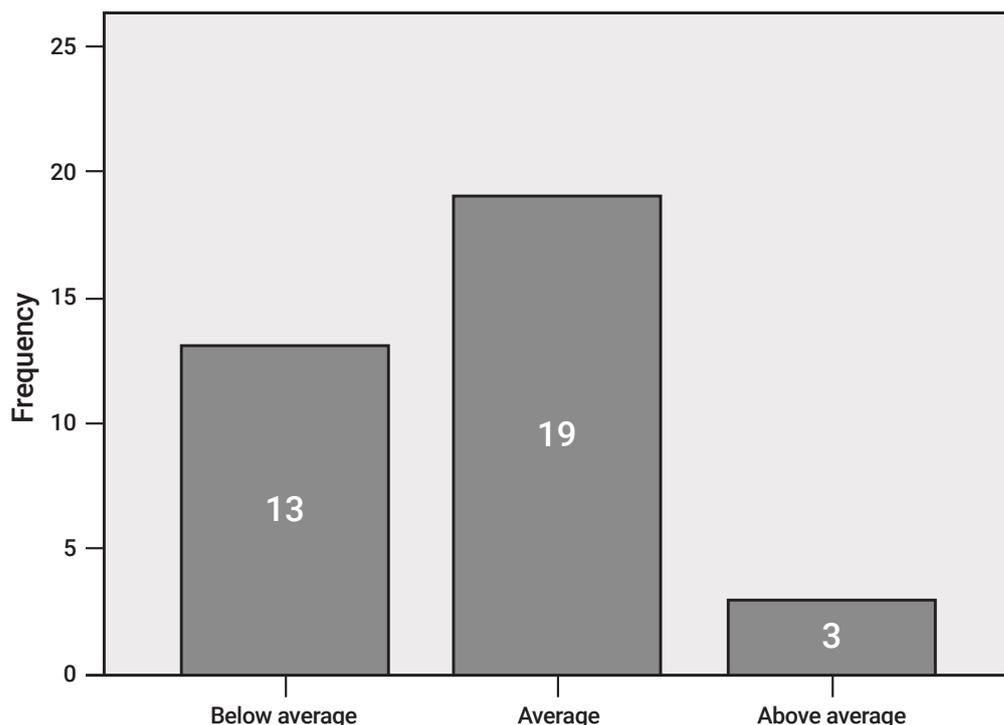


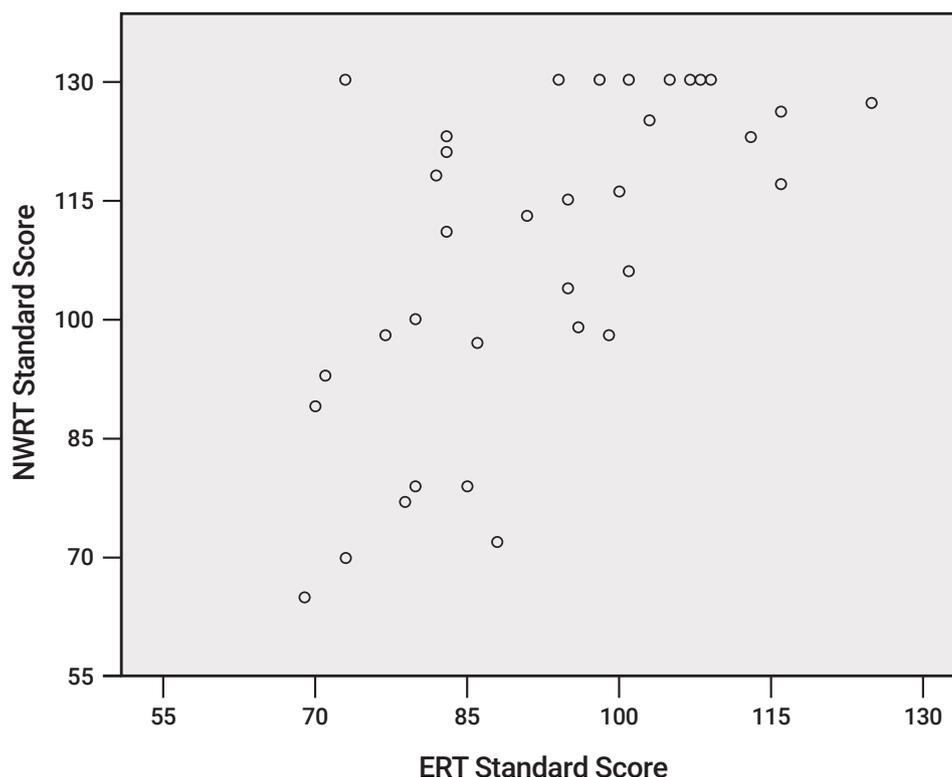
Figure 4.11 ERT results in qualitative categories



It would appear from the sample in this study that there is a disparity between phonological decoding scores and comprehension scores among the sample. Only 6 of the pupils (15% of the sample) had below average skills in phonological decoding, but this was not the case in comprehending skills. More than double the amount of pupils had below average reading comprehension scores compared with phonological decoding scores, with 13 of the pupils (or 37% of the sample completing that test) achieving standard scores of <85 on the ERT.

Notwithstanding this, there was still a strong positive correlation between standard score results in the ERT and the NWRT, meaning that pupils who scored highly on one tended to score highly on the other, and vice versa ($r = 0.64, n = 35, p < 0.001$). However, on closer examination of the scatterplot of these two variables (figure 4.12), it is evident that there are a number of pupils who scored very well on the NWRT, achieving at or near the maximum of that scale, but did not achieve at a similar level on the ERT.

Figure 4.12 Scatterplot showing correlation between NWRT and ERT standard scores.



Thus while the overall trend of positive correlation is there, it would appear that there are several pupils in this study who have excellent phonological decoding skills, but who do not comprehend everything they decode.

Given that this is a relatively small sample, it is worth looking at standard scores on an individual level. It is evident that pupils tended to perform better on the NWRT than they did in their ERT. In total, 28 pupils had a higher standard score on their NWRT than on their ERT, with only 7 having a score on the ERT that surpassed their NWRT. In addition to this, the gap between the NWRT high scorers and their lower ERT score (mean gap = 21) tended to be wider than those who had a higher ERT score (mean gap = 5). The mean gap of one standard deviation between the higher NWRT and the lower ERT is an important finding. This might indicate that pupils can have very good phonological decoding skills but quite poor comprehension skills (demonstrated by the wider gap in that direction), but if a child scores better in comprehension than on phonological decoding, that gap is less pronounced. Indeed, the biggest gap for an individual was a child who had a standard score of 123 on the NWRT (above average skills) and 83 on the ERT (below average skills). This suggests two things: 1) pupils in this sample needed to be able to phonologically decode first in order to comprehend, evidenced by the fact that very few scored higher on comprehension than phonological decoding and when they did the gap was minimal 2) many DHH pupils in this sample appear to be decoding text phonologically to a much better level than they are comprehending text. In the classroom, these pupils may appear to be very skilled in reading aloud, but this does not equate with their comprehending what they read. On both counts, teachers need to be vigilant in monitoring overall comprehension abilities for this cohort.

Test Results Compared by Class Groups

A number of studies cited in the literature review highlight that there is a gap between DHH pupils' reading ability and that of their hearing peers, and that this gap widens over time. As we saw above, DHH pupils in general, in this sample, were above average compared with their hearing peers in the NWRT and they were within average range in the ERT. However, if we look at the mean scores in both tests and net reading ages by class groupings, we can examine whether or not there is a pattern of a widening gap across the course of the school years.

Figure 4.13 presents the average chronological age of students during the testing and their equivalent average reading ages based on their scores in the NWRT and ERT assessments. In the 1st and 2nd classes, students *surpassed* their chronological age based on the NWRT scores, whereas based on their ERT scores, they performed slightly lower than would be expected based on their chronological age. In the 3rd and 4th classes, students performed lower than their chronological age both in the NWRT and ERT assessments. Similarly, in the 5th and 6th classes, students performed lower than their chronological ages. Overall, pupils' reading ages, based on their scores, were consistently lower in the ERT compared to both their chronological age and their NWRT reading age.

Figure 4.13. Average chronological age and NWRT and ERT reading ages in months by class groupings

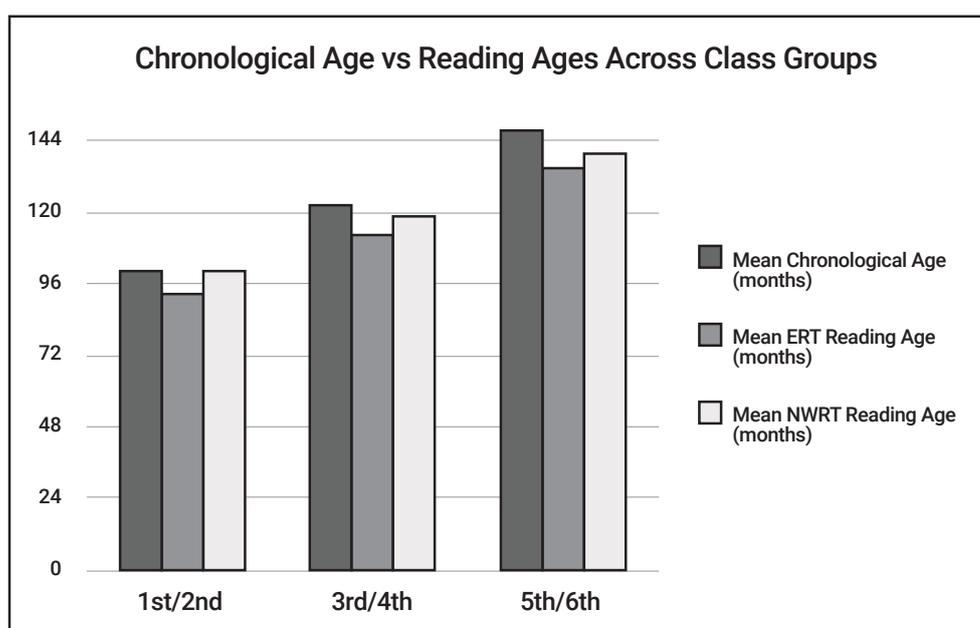


Table 4.4 shows the average standard scores for pupils across the three main class groupings in the NWRT, showing that NWRT standard scores improve as pupils' progress through the school system (perhaps owing to more developed phonological skills as pupils' experience with listening increases). However, their ERT standard scores are not going in the same direction. In fact, there is an observed decline in 3rd/4th class and scores do not recover from there. However, using an Independent Samples *t*-Test, the difference in means between these groups was not shown to be statistically significant.

Table 4.4 Comparison of Mean NWRT and ERT Standard Scores Across Class Groups

Class group	Frequency	Mean NWRT	Frequency	Mean ERT
Group 1: 1 st /2 nd	14	106.9286	14	94.0000
Group 2: 3 rd /4 th	14	110.1429	13	91.0769
Group 3: 5 th /6 th	12	115.7500	8	91.7500

Similarly, if we examine the average net reading age across the three class groupings (table 4.5) it appears that there is a gap that widens over time, with the worst results evident in the ERT results:

Table 4.5 Comparison of Mean Net NWRT and ERT Reading Ages Across Class Groups.

Class group	Frequency	Mean Net NWRT Reading Age	Frequency	Mean ERT Net Reading Age
Group 1: 1 st /2 nd	14	+ 1 month	14	-6 months
Group 2: 3 rd /4 th	13	-6 months	13	-10 months
Group 3: 5 th /6 th	11	-6 months	11	-12 months

Using the whole sample of students ($n=40$), related-samples Wilcoxon Signed Rank tests were conducted to check if these observed differences between students' chronological ages and their respective reading ages in the NWRT and ERT assessments were statistically significant. While students' equivalent ages did not seem to differ significantly from their chronological ages based on their NWRT score; $T=365.5$, $p=0.550$, students' equivalent reading ages ($Mdn=108^7$) seemed to differ significantly from their chronological ages ($Mdn=121$) based on their ERT scores $T=154.0$, $p=0.003$, $r=-0.34$. The negative direction of this relationship suggests that as pupils get older, their reading age on the ERT goes down, indicating a widening gap with age. The same pattern was evident in vocabulary percentage scores. Spearman's rho was used to see whether class groupings was related to vocabulary scores. A statistically significant relationship was found ($r_s = -0.45$, $p=0.004$). The relationship is a moderate one, but negative, indicating that as pupils progress through school, their relative vocabulary scores worsen. This is likely to be in part caused by the increasing difficulty in the vocabulary subtest on the ERT as pupils get older and the difficulties faced by DHH pupils in acquiring more complex vocabulary as they progress through school.

In summary,

- Most DHH children in this sample were reading at a level deemed to be average.
- The test results of the NWRT and the ERT suggest that there is a pattern of considerably better scores in phonological decoding (measured by the NWRT) than in comprehending (measured by the ERT), which is of concern.
- There is a pattern of dis-improvement over time in the ERT scores. DHH pupils in older class groups had, on average, poorer scores relative to their hearing peers and a wider gap between their own age and their reading age compared with DHH pupils in younger class groups.

Relationships Between Other Variables and the Reading Test Results.

A series of statistical tests and descriptive analyses were conducted to examine relationships between independent variables and the reading test results.

Gender

The average standard score in the NWRT for boys was 113.2 ($SD=20.4$) and for girls was 108.7 ($SD=20.6$). On the ERT, boys' average standard score was 98.0 ($SD=16.1$) and girls was 91.2 ($SD=15.0$). Based on Independent-Samples t -test results, boys and girls did not differ statistically significantly on their standard scores (NWRT: $t(37)=0.679$, $p=0.891$; ERT: $t(35)=1.304$, $p=0.882$).

⁷ Age is measured in months here, hence the higher numbers.

Household Factors

Data were collected on family net household income. There were nine categories of household income but owing to the small sample size, these were recoded into three variables for the purposes of statistical analysis. The relationships between family economic status and students' standard scores in the NWRT and ERT were tested through Spearman's rho. Family economic status was not statistically significantly related to students' standard scores in the NWRT but it was for the ERT ($r_s=0.44$, $p=0.021$) with parents from higher income households having pupils with better ERT scores.

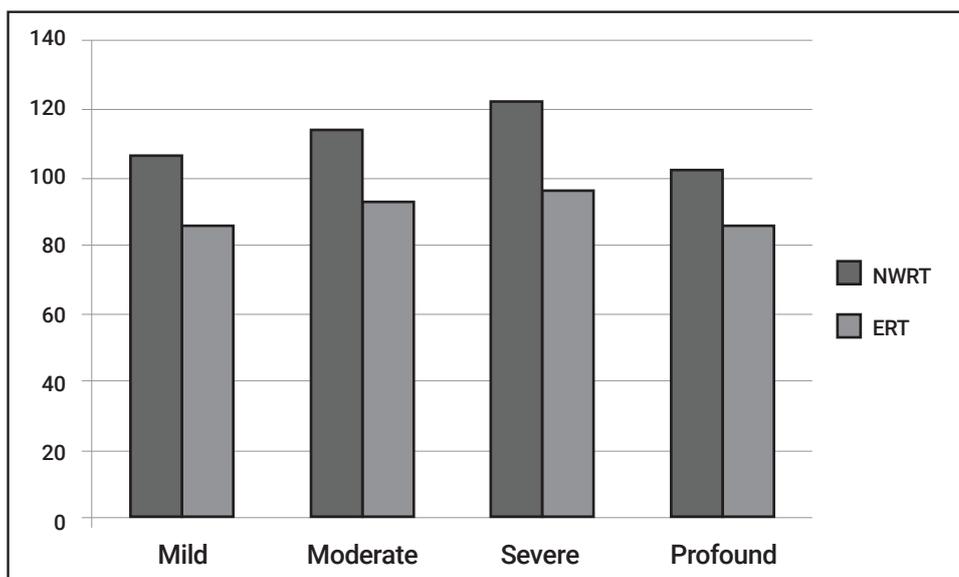
The relationships between parental education and students' standard scores in the NWRT and ERT were also tested through Spearman's rho. Parental education was not statistically significantly related to students' standard scores in either the NWRT or the ERT. This is somewhat surprising given the relationship between family income (often a proxy for parental education level) and ERT scores found above, coupled with the fact that there was a very strong, statistically significant positive relationship between parental education and income level ($r=0.80$, $p<0.001$). However, it may be that family income here is a proxy for another unknown variable. It may also be a factor of the restricted range of parental education levels among participants in this sample. Consideration should be given in future studies about what other hidden variable may be involved here. Possible variables include access to private resources, different school demographics and other factors that might correlate with higher income levels.

The relationship between parental hearing status and their child's score in the NWRT and the ERT was tested through the Independent Samples *t*-Test. No relationship was found between parental hearing status and their child's score on either test. Neither was there a relationship between parent's age and their child's score in either test, as tested through the Spearman's rho. The time parents spend on spoken language activities and its relationship with the students' standard score in the NWRT was tested through Spearman's rho. There was no statistically significant relationship between the two variables.

Levels of Hearing Loss and NWRT and ERT Scores

Parents reported the level of hearing loss their pupils had. This data was used to classify pupils into four groups of hearing loss: mild, moderate, severe and profound. The average scores for each category of pupil in each test are presented in figure 4.14 below:

Figure 4.14 Mean test scores (standard scores) by category of hearing loss.



NWRT performance outranked ERT performance across all four categories. What is worth noting, perhaps, is that both NWRT and ERT performance for pupils in the category of mild hearing loss is lower than that of pupils who are in the moderate or severe categories. The ERT score for pupils in the mild hearing loss category is equal to those who are in the profound hearing loss category (average score of 86), though they scored better in the NWRT. There were only two pupils in the sample who had mild levels of hearing loss, for this reason, statistical testing was not appropriate for this finding. Subsequently, further research is needed to examine this pattern with a larger sample size.

Use of Hearing Aids and Cochlear Implants

The relationship between pupils' use of hearing aids or cochlear implants and their test scores was checked using the Independent Samples *t*-Test for the ERT and the Mann Whitney U Test for the NWRT (since it is not normally distributed). No relationship was found between use of hearing aids or cochlear implants and the ERT but a statistically significant relationship was found with the NWRT standard scores ($U=2.695, p=0.016$). The cross tabulation below (table 4.6) demonstrates that pupils with cochlear implants were more heavily represented in the 'below average' grouping than pupils who used hearing aids, perhaps reflective of the fact that their more severe hearing loss is impacting on their phonological awareness. It is worth noting, however, that most children with cochlear implants were still in the average/above average range on this test.

Table 4.6 Cross tabulation showing the pattern of performance on the NWRT across categories of hearing aid/cochlear implant use.

			Hearing aids	Cochlear implants	Total
NWRT Qualitative Scores	Below average	Count %	1 5%	4 30.8%	5 15.2%
	Average	Count %	6 30%	3 23.1%	9 27.3%
	Above Average	Count %	13 65%	6 46.2%	19 57.6%
Total		Count	20	13	33
		%	100%	100%	100%

The Relationship Between Vocabulary and Reading

In each of the three levels of the ERT used in this study, there are four subtests. One subtest common to all three levels is vocabulary. Using the total raw score for the vocabulary subtest out of the total possible score on that subtest, a vocabulary percentage score was calculated for each pupil. As would be expected, there was a strong positive relationship between the vocabulary percentage score and the overall ERT score ($r=0.69, p<0.001$). This should be expected since the vocabulary percentage score represents a subtest on the ERT. These findings confirm earlier evidence showing the relationship between vocabulary ability and overall reading comprehension (Dillon et al., 2012). In support of this, there was also a moderately strong statistically significant relationship between overall vocabulary score and the sTen on record for pupils ($r=0.47, p=0.010$). As well as this, there was a statistically significant, moderate positive relationship ($r_s=0.33, p=0.039$) between vocabulary percentage score and the overall score on the NWRT.

The relationship between vocabulary and a number of other independent variables was tested to establish if any had statistical significance. The variables used included parental education level, household income, time spent on spoken language activities in the house, the child's level of deafness, and whether or not they used hearing aids or cochlear implants. The only variable with a statistically significant relationship was the child's level of deafness ($r_s=0.34$, $p=0.043$) which had a moderate positive correlation with the vocabulary score. Pupils with more profound levels of deafness had lower vocabulary scores and those with milder levels of deafness had higher vocabulary scores. Vocabulary percentage scores were also tested against hearing aid/cochlear implant use. There was a considerable difference in the means of each group (see table 4.7 below), though this difference was just outside of the level for statistical significance ($t(32) = 1.995$, $p=0.055$).

Table 4.7 Comparing the Mean Vocabulary Scores of Pupils Who Used Cochlear Implants to Those Who Used Hearing Aids.

		N	Mean
Vocabulary score (percentage correct)	Hearing aids	20	65
	Cochlear implants	14	46

This difference, as well as the difference between children across levels of deafness may be down to the barriers to acquiring vocabulary incidentally. Children with less severe levels of deafness may be more inclined to acquire vocabulary incidentally which could lead to better overall vocabulary scores. The lower score of pupils with implants reflects a range of other studies challenging the assumption that students with implants should outperform their DHH peers without implants (Marschark et al., 2007), though it is important to bear in mind that in the present study, there may be differences in other background variables other than technology used contributing to the differences above.

In summary:

- Household income was the only independent variable from the parent-demographics to have a statistically significant relationship with pupils' test scores, and only with the ERT.
- Pupils' NWRT standard scores differed significantly between pupils who used hearing aids and those who used cochlear implants, with the latter group showing poorer results overall. Vocabulary scores on the ERT showed a similar pattern but was just outside the level for statistical significance.

Validity and Reliability Considerations

When collecting data, there is always a risk that what we observe is not an accurate reflection of the true situation. In other words, we may obtain test results that do not reflect the actual ability of the pupil being tested. The discrepancy between what we observe and the pupil's true ability is called measurement error and there are a number of ways we endeavoured to reduce that error, or test for that error in this study.

First, to ensure reliability, two standardised tests were used to assess skills in reading and the tests were administered carefully as per the test manual. Both tests were carried out by the same individual, a research assistant, with all pupils thus ensuring that there was no variation in test procedures. The research assistant and one of the lead investigators (Mathews) carried out a pilot prior to the main study to practice scoring both tests and the Nonword Reading Test was audio-recorded in the main study to ensure accurate scoring. These precautions ensured that there was no variation between pupils caused by differences in test administration. Nonetheless, the research assistant kept field notes following each test so that anything that may threaten the conditions of the test was noted. In a small number of cases (discussed earlier), this resulted in a pupil's test results being excluded from the study because they were felt to be an inaccurate representation of their true ability (e.g. in the case of one pupil who did not return for the second half of a test).

The reliability of each level of the ERT was checked using item analysis to establish internal consistency. All three levels of the ERT were found to be highly reliable (ERT 1: 91 items; $\alpha=0.94$; ERT 2: 93 items; $\alpha=0.94$; ERT 3: 119 items; $\alpha=0.97$). Each of the subtests in the ERT levels 1 and 3 were also found to be reliable. On level 1, the vocabulary subscale consisted of 20 items ($\alpha=0.83$), the syntax subscale consisted of 30 items ($\alpha=0.86$), the sequences subscale consisted of 20 items ($\alpha=0.86$) and the comprehension subscale consisted of 21 items ($\alpha=0.87$). On level 3, the sequences subscale consisted of 32 items ($\alpha=0.91$), the facts and main ideas subscale consisted of 38 items ($\alpha=0.90$), the use of context subscale consisted of 27 items ($\alpha=0.93$) and the vocabulary subscale consisted of 22 items ($\alpha=0.85$). On level 2, three out of four subscales were found to be reliable, and the fourth was just below the cut off ($\alpha>0.70$). On level 2, the vocabulary subscale consisted of 20 items ($\alpha=0.80$), the comprehension of sequences subscale consisted of 20 items ($\alpha=0.75$), the use of context subscale consisted of 40 items ($\alpha=0.88$) and the comprehension of main ideas subscale consisted of 13 items ($\alpha=0.67$). The final subscale is the only example of questionable reliability. Some further research on this particular subscale would be beneficial to establish if there is a difficulty using this subscale with this population. Nonetheless, the reliability of the three tests overall was acceptable.

Criterion validity evidence with respect to reading ability was gathered by comparing pupil's scores on the ERT and the NWRT with their prior scores on the Drumcondra Reading Test or the Micra-T Reading Test administered by their school. A statistically significant positive relationship was found using the Spearman's rho between existing sTen scores (from the Micra-t and the Drumcondra Reading Tests) and both the ERT standard score ($r_s=0.82, p<0.001$) and the NWRT standard score ($r_s=0.46, p=0.010$). The very strong relationship with the ERT in particular would suggest that this test works well with this population and that generally, similar results were found using the Irish normed tests and the British normed ERT. The slightly weaker score with the NWRT is likely caused by the fact that existing test scores are from a reading comprehension assessment rather than one assessing decoding skills. While these skills are related (and still correlate with each other), they are somewhat distinct.

What Teachers Said: Results from Interviews with Teachers

The qualitative data were collated from interviews conducted with 14 class teachers who had a pupil who was DHH in their class. The focus of the interview was to explore the assessment practices used by teachers in relation to reading comprehension, the type of assessment used, the level of reporting of the test results to the DES and to parents and the extent to which teachers perceived the levels of support given as adequate to support the development of literacy – reading comprehension strategies – for these pupils.

The qualitative data were analysed using NVivo software and themes were identified from multi-phase coding (see methodology chapter). The three themes that emerged from the qualitative analysis were as follows: *Teachers' varying satisfaction with pupils' progress*, *Assessment issues*, and *Challenges facing teachers*. These main themes are discussed in keeping with the sub themes that were identified (table 4.8).

Table 4.8 The Themes and Subthemes Emerging from the Interviews.

	Main Theme	Sub themes
Theme 1	Teachers varying satisfaction with pupils' progress	<p>General overall satisfaction</p> <p>Factors contributing to delay</p> <p>Progress in language</p> <p>Progress in literacy</p>
Theme 2	Assessment issues	<p>Formal assessments – tests used and frequency – adaptation of tests</p> <p>Assessment of Languages</p> <p>Receptive and Expressive Assessment of Reading Comprehension</p> <p>Assessment of phonics word recognition</p> <p>Reporting to DES and to parents, content of communication, method of communication, regularity of communication</p>
Theme 3	Dealing with Challenges	<p>Professional level, pupil level and school based challenges</p> <p>Level of support for teachers</p> <p>Parents, Resource/ Learning Support/ Visiting Teacher Service</p> <p>Teacher future needs</p> <p>Professional development/ resources and guidelines</p>

Theme 1: Teachers' Varying Satisfaction with Pupil Progress

Teachers were asked whether or not they were satisfied with their pupil's progress. Teachers were split evenly in terms of whether or not they were happy with their pupil's progress (7 teachers were and 7 teachers were not). Of those who were, they varied in what they deemed 'satisfactory' progress. For some, this was expressed in terms of the pupil being of exceptional ability:

Yeah I'm absolutely satisfied yeah. Absolutely, this boy is a 10 out of 10, he's excellent! I could see how it could be an issue with other pupils, and this child is profoundly deaf, but he just is an amazing kid and really, really bright and really focussed and really motivated so it's been a joy to teach him, it's been an absolute pleasure and it's been relatively easy to teach him. But in that regard maybe he's an exception to the rule? He doesn't need a lot, do you know what I'm trying to say? He's very bright and his hearing impairment is not really holding him back (C405).

Definitely! She doesn't stand out in any way, she's above average. The particular pupil I have is doing really well at the tasks. (C410).

For others, satisfaction with progress meant that the pupil was keeping up with others in their class:

Teacher: Yeah I certainly would be [satisfied] yeah.

Researcher: He's not falling behind in any way?

Teacher: I don't think so, no! (009b)

He's doing the same Maths, he's doing you know the same S.P.H.E, the same S.E.S.E, the P.E you know he is following the curriculum the same as the others so maybe if I had a child who had a more severe deficit I would be looking for more help (C405).

For other teachers, they felt their pupil was achieving at a satisfactory level given their deafness, or as one teacher put it, "for her level":

I was going to say no [I wasn't satisfied], but the child did work hard so, for her level, yes. For her level, because she did actually work hard and she was somebody who got rather worried and stressed about things. Well we'll say her expected outcome was different but she certainly worked and she did her best to her level. She was able to tackle most of what the class were doing but fell behind I'd say in relation more to input really (009a).

Thus, while there was variance in the criteria used by teachers used to determine satisfaction with progress, in general terms, many teachers were pleased with the attainment of their pupil's to date.

Factors Contributing to Delay

Other teachers, however, reported less positive outcomes for their DHH pupils:

No, I wasn't satisfied with his [progress]... he could decode a word but if he was reading a piece you know it wasn't his first thing to do, he would try to guess it and glide over it and even though he learned say the DOLCH sight words the most common words, he wouldn't use them, he wouldn't recognise them in a text, he wouldn't recognise "the" maybe (C011).

For some pupils, the reasons cited for this delay related to late identification of deafness:

He was a weak child, I taught him for 2 years, I had him in 1st class and 2nd class and he only identified as being hard of hearing at the end of 1st class which was a surprise to me, I hadn't spotted anything myself. He was a weak child he was going to learning support in 1st class anyway and the teacher who had him in Infants also had him for 2 years in Junior Infants and Senior Infants and we were both very surprised when we heard he was getting hearing aids and I wondered straight away about this when he got them, would it make a difference - obviously overnight it is not going to make a dramatic change but I wondered would it become apparent that this was why he was struggling. He didn't make significant progress (C001).

For some teachers, the late identification of deafness meant their pupils had missed out on early language opportunities:

So if you wanted to get him to talk you were delighted to get anything in the beginning because he was very, very shy because he sat quietly I think in playschool and you know they all thought he was very good and he was really good but it was all going over his head. You know he didn't understand, he didn't hear it for start I think (C011).

See I think with this particular child he didn't get his hearing aids until he was 4. So he got those the week before he started school in Junior Infants so he'd a huge deficit of language (C011).

Not getting a good start in the Infant years caused problems for another pupil as the workload expanded in 1st class.

Well I spoke with the mam and I think maybe just in the Infant room the noise level is quite high and in my own opinion I feel that he just missed out on some of the basics from the beginning ... I don't know if he got a whole level of support individually and then by the time he came to 1st class he was just missing a few of the sounds and yeah I think myself that the noise probably in an Infants room can get... I am not sure of what numbers where in his class in Infants but I think that might have been it (C408).

For some children, their deafness was coupled with other medical problems resulting in the pupil, despite additional support, struggling to keep up with the learning outcomes for the class group.

And this child as well he had epilepsy or had so there were kind of medical issues involved that they were more worried about those when he was 2 and 3. Now he hasn't had any seizures now but like for the whole Junior Infants he was worn out by Easter because there'd be so much coming at him. You know after a holiday and that was in Senior Infants and in 1st class the others just went ahead with their level and you know he was more plodding, do you know? (C011).

Teachers cited poor working memory and a lack of concentration as a cause for the lack of progress:

I'm not sure if this was to do with deafness? I think it's working memory... (C011).

But the concentration is very poor you know, you're not going to be seeing much progress if he didn't know his words, he can read a sentence but they're very short, he'd only really be entering at infant level (C412 – child aged 9.5).

For other pupils there were additional problems associated with medical and learning difficulties:

This child as well he had Epilepsy or had so there were kind of medical issues involved that they (parents) were more worried about those when he was 2 and 3. Yes now he hasn't had any seizures now because they're coming aroundthey've always been very supportive but like for the whole Junior Infants he was worn out by Easter because there'd be so much coming at him.

Well, she is different in ability as well, like I think with [pupil]. I know she has the hearing difficulty but she also has you know a learning difficulty as well to be honest and so I do think she is at a disadvantage in the fact like you know she is finding 5th class that bit harder because as she progresses obviously work is going to get harder and this is also reflected in Maths where the language is getting tougher and I have to spend and luckily enough I've 22 pupils in the class so it's a small class group (C024).

While there was variation in how teachers determined being satisfied or not with pupil progress, lack of satisfaction with progress was very closely aligned to actual test scores on the ERT. All of the teachers who were unsatisfied with progress had pupil's reading below average on the ERT.

Satisfaction with Progress in Language and Literacy

The ability to express oneself is critical to developing vocabulary and vocabulary in turn contributes to literacy outcomes. Many teachers spoke about their pupils' language skills noting that while some had good expressive language, others had significant gaps in that skill set which impacted on their ability to express themselves. Teachers discussed how these strengths and difficulties impacted on pupils' progress in oral language overall:

I mean his language is very good, his oral language is very good; he was well able to talk about anything and spoke very clearly (C001).

There would be gaps in her receptive language and there would be gaps in her oral language because, this would be where she doesn't speak very freely at all and just really answers when she needs to and just doesn't like answering out in class either. Yeah, her ability to express herself certainly would not be in line with the other pupils in the class, she wouldn't have the same ability to express herself (C009a).

So he'd a huge deficit of language ...he has a real deficit of that vocabulary. So if you wanted to get him to talk you were delighted to get anything in the beginning because he was very, very shy because he sat quietly I would think that he had poor receptive language skills? Coming to school without that early language, I mean he wasn't the only one, but his problem was specifically you know his deafness, but it does impact on their learning (C011).

Some teachers made a strong link between language and reading, particularly as it related to phonics:

Well I think at the moment her difficulty is that she's not getting speech and language [therapy] so she's missing an awful lot of you know the beginning and ends of words so phonics is an issue so it's holding her back in terms of her reading because she doesn't have the phonics that the other kids have, even though it's been done with her and it's done on a whole class level you know, she's missed some of it because obviously she isn't hearing it or whatever (C026).

For some pupils, teachers noted that there was an issue of lacking confidence initially which impacted on their self-confidence as a reader.

...he's come on loads in the past year now, his confidence wasn't there when he first began either because he was a bad reader so he singled himself out as a bad reader and wouldn't read in front of others but I see in the past year now he's come on hugely and his reading is now...he would be average now for his class (C408).

Small groups given additional support and praise and encouragement, coupled with high frequency of engaging in reading tasks was seen as a key to developing this pupil's self-confidence as a reader.

In the beginning he was only reading in front of you know smaller group and we'd do reading stations as well where the Learning Support Teacher helps out, again it's in smaller groups and he would have been put in a group of people of his own ability. That would have helped his confidence too, his reading with others at his level rather than just people his age. It's more to start off in smaller groups I suppose and then that would definitely have helped his confidence. Just lots of encouragement and praise when he did really well... (C408).

However, in spite of differentiated approaches and additional support, some teachers expressed surprise at gaps in their pupils' achievement. One teacher mentioned a low score her pupil obtained on formal assessment believing that they would have - based on the class assessments - scored much higher:

I would have said that [I was satisfied with her progress] during the year from September to May/June, because I felt that there was a lot of support given to the child, she had a teacher of the deaf that was coming to visit her once every 2 weeks, she had a lot of resource hours and I felt it was all coming together and she was making progress based on my own assessment. But yet when her standardised test scores came through at the end of May, I suppose wasn't expecting the score that she got. I felt that she scored far lower than what I would have anticipated her to get (C004).

Some teachers also reported a gap in reading comprehension which resulted in most cases from a lack of general knowledge.

The things that other pupils attack easily or more easily and there is perhaps a bit of a shortfall there for herself as she negotiates her way through daily life and into the future as well how much is she losing in terms of basic maybe even vocabulary or comprehending things that other pupils know instinctively! (C401).

I found that I'd be surprised at the things that she didn't understand. I mean we could be doing, I remember distinctly we were doing this whole piece last year in Autumn so into [child's name]'s book we were doing migration and flights and all these different things to do with that and then at the end of the whole topic I realised that [pupil] didn't even realise that birds eat insects that she thought birds eat grass and she couldn't understand why we were doing this whole thing why birds migrate and I felt that was something that I had just presumed she knew and I kind of found that there were things that I was surprised by. I just took for granted that she would know so I felt that I really didn't have a lot of knowledge of where I would start with [pupil] you know, the starting point I suppose was the thing that I didn't evaluate (C004).

Yeah, well she'd be very clear and you would expect a lot more from her because her reading is so good. She would be one of my better readers in the class and she has all the... she would be very clear, very loud, would be expressive but yet her understanding of the language that she is reading, she doesn't have, or you'll ask her a question about it, ask her to find another word that means the same, she finds that she has great difficulty with that activity (C024).

There are unusual gaps – surprising! (C401).

Theme 2: Assessment Issues

Teachers were asked a number of questions about assessing their pupils. They reported that all pupils except one were included in formal assessments and in all but one case these were reported to the DES at the end of the school year in 2nd, 4th and 6th class. The most frequently used tests were the Micra-T and the Drumcondra Reading Test and pupils took these tests at the end of the year in May or June. It was apparent from speaking with teachers that a range of assessments were being used with pupils:

Well all pupils would do the Drumcondra testing which would be later in the year and they would have done the Sigma and the Micra T now one is Maths obviously and the other is English so he would do those standard tests. And then with the learning resource teacher like I think last year he would have done in Senior Infants the MIST test. In September 2016 she would have done the Quest reading screening test, she would have done a single word spelling test, Jackson phonics, the sight words and then in 2017 she would have reviewed the single word spelling test, the Jackson phonics, the sight words, the DOLCH words you know that he's constantly going over those and being assessed (C405).

Teachers reported that apart from being withdrawn to complete the test with the Learning Support, or through using the sound systems there were no other adaptations made for these pupils.

Yes, so [names pupil] had 2 sound systems, she had the microphone sound system and she also had the comfort audio sound system so for her Drumcondra she did her Drumcondra in with the class where they used the teacher that was given the test use the microphone and then for her test with the YARC she did that on a one to one with a resource teacher and the resource teacher used the comfort audio system for her (C004).

As well as formal standardised testing, other informal class tests took place on a weekly basis.

Well there'd be the weekly spelling test and table test and there's monthly tests on History, Geography, Science those things and I mean it might be one thing as topics arise then there's the standardised test at the end of a school year (C023).

For the most part, teachers were confident in their discussion of assessing word recognition and phonics, with many using structured programmes for teaching and subsequently assessing skills in this area:

We would have tested them on it would have been the Dolch list that kind of them but now we're very much with Jolly Phonics and the tricky words list (C001).

I assess her phonics, I do- let's say the resource teacher would do the Toe by Toe which is working really well for her in learning support so that she spends 20 minutes with that a day with herself and 2 other pupils that are in that group and then with me I would do, let's say I would do kind of I find that [pupil] needs to start at the very beginning this year do you know -letter sounds, isolating letter sounds, blend all of the things that I took for granted that she'd knew but she doesn't (C024).

The same in their spellings at the moment they've a list of 18 spellings so they're phonetically based but you kind of build on their vocabulary all the time, they're building up their word recognition skills through their spellings each week and they play different games and stuff with the spellings that's when they're putting them into different sentences and they're using them in different ways (C009b).

Assessment of both word recognition and phonics took place very regularly:

Yeah, her phonics will be on a weekly basis (C402).

We would have been constantly reviewing them and seeing how he was doing with that kind of thing (C001)

I would find the DOLCH list very useful with [names pupil] because obviously they're the words that come up regularly and they are the words that are either hard to kind of remember or retain so they're the words I would do a lot with her because they're in everything you know?(C024).

The importance of assessment in phonics is reflected in this teacher's remark:

Letter sounds, isolating letter sounds, blending, all of the things that I took for granted that she'd knew but she doesn't. Because she's mixing up like let's say 'he' and 'she' and 'we', she's not getting the pronunciation of the initial sounds and words (C024).

For another pupil, due to ongoing teaching and assessment in the earlier years, there was no need to assess phonic ability any further:

No he would have had assessment for phonics you know through the school and he has mastered all of his and I mean there are some sounds that he would still struggle with but he's mastered them so well so at this stage there's no need to dwell a laboured point (C023).

With regarding to assessment of reading comprehension, teachers were first asked a general question about what reading comprehension involves. Most were very clear in the types of skills pupils needed to comprehend text:

Reading comprehension is where a child can take meaning from whatever they have read so that they can understand what they have just read and that maybe they can expand on it with their own scheme or prior knowledge of it, so it would be what they can take from a story what they have just read and if they've understood and expand (C004).

Ok you'd be looking to see if they can make any connections with any other thing that they've read or they could tell you what was happening in the story or they could elaborate about any of it just that they would have the general gist that they'd be able to talk about it and talk about their own experience on it so just to make sure that they knew what they were reading (C011).

Well I suppose the pupil demonstrates that he understands what they read in the text and that he's able to maybe make predictions for based on what he has read and he can predict what may happen or that he can maybe make connections between something he's read and something he's read in another book or something that's happened in his life or something he's aware of already (C011).

Given the discrepancies between the NWRT and ERT results among the pupils tested, suggesting a gap between the two main skill sets of decoding and comprehension, we were interested to compare assessment practices among the teachers for these skills. As was discussed above, teachers used regular and structured assessment of decoding in their classrooms, often through phonics instruction programmes. On the other hand, many of the teachers were vaguer in their response on how they assessed comprehension with their DHH pupil. For example, teacher 026 responded as follows on the assessment of phonics:

So at the end of Senior Infants we did the MIST test and that would look at your phonics, what letter sounds you know and then in 1st class we'd go over, we'd use the jolly phonics so we'd assess her using the jolly phonics program...

versus comprehension:

I: Ok and do you assess this pupil's comprehension?

R: No, I wouldn't say I do, no. [then later added] it's informal, she comes up to me and reads for me.

Likewise, for teacher 024 on assessing phonics:

I assess her phonics, I do – let's say [the resource teacher] would do the Toe by Toe...so she spends 20 minutes with that a day...I would do...letter sounds, isolating letter sounds, blends...I started back doing the Newel programme...etc

versus comprehension:

I wouldn't have any specific tests, formal tests obviously you have at the end of the year.

And for teacher V408 on phonics:

yes we assess orally and then we have a phonics book as well that I'd test and I suppose the spelling test again would be more phonics every Friday before the formal test

versus comprehension:

*I would just check that he knows what he has to do and he has an understanding.
Again it would be a lot orally mostly.*

While there was a trend to less formal, less frequent assessment of comprehension overall, there were some teachers who could give a very detailed account of how they assessed comprehension, with some making reference to inferential and higher order skills:

So what we would do to get meaning from the text is the same as all the other pupils, he would read it and you know he would be encouraged to find the answers within the text you know, questions on what he's after reading like who, what, when and where? What do you think happened before and what do you think will happen next? Why do you think? You know it's all questioning on it, if he was stuck on anything he'd really have to focus on the picture visually, you know, what can you tell from the picture and then his own opinion, do you think it's a good title for this story He's coached on all angles too, comprehend the passage first and then use other skills like the visually or you know clues or what contextual clue as well you know (C405).

We use a lot of reading cards, guided reading cards also the comprehension work at the end of each lesson and the textbook as well is a written record and you can see clearly if the pupil has got the answers and understands or not (C041).

I would have regularly assessed so at the end of every term comprehension - so reading an unknown piece and answering questions on it and I would have had a section on vocabulary so words that are opposite in meaning or different things like that (C004).

One teacher was less confident in her approach and expressed that help was needed:

[Comprehension] is the big area. I would love somebody to come in and say like this is what you should be doing. Do you know? I would love extra help! (C024).

The importance of ongoing and informed assessment of comprehension was highlighted in the case of one teacher who regularly assessed her pupil's reading by having her read aloud. Since her pupil read fluently, the fact that she did not understand what she read caused some surprise:

Now this is hard to understand or describe! She is a very fluent reader but doesn't understand what she's reading. Yeah, well she'd be very clear and you would expect a lot more from her because her reading is so good. She would be one of my better readers in the class and she has all the... she would be very clear, very loud, would be expressive but yet her understanding of the language that she is reading she doesn't have or you'll ask her a question about it, ask her to find another word that means the same as, she finds that she's great difficulty with that activity (C024).

Owing to the strong link between language and literacy skills, teachers were asked about their assessment of language skills. This was of particular interest given the gap between decoding and comprehension and the relationship between language skills and the latter. Like assessment of comprehension, it was clear that teachers are assessing language skills – *receptive and expressive* – in an informal manner with teacher observation being cited as the most frequently used assessment approach. Teachers mostly acknowledged that they did not use any formal means of assessing language skills:

I would say maybe orally or informally I would have been doing throughout the year but as far as an actual assessment test, no! (C004).

Again no, informally, but I suppose I didn't have a test or there was no test given to me that would have given me structure to that so no. (C009b).

Well we'll say there was observation assessment as in the resource teacher designed tasks in what they were doing every day, that type of thing (C009a).

I'm looking at things like yeah receptive language, expressive language, functional language. I suppose a lot of it is informal assessment, I've no formal assessment of any of that. It's observation and it's engagement (C023).

Her expressive language skills I suppose [I'd assess] orally, by giving her tasks to do (C024).

I just knew he was weaker than the others (C011).

While there was awareness of gaps in pupils' language both receptive and expressive – teachers did not assess language to the same extent that they reported their assessment of reading and comprehension. Furthermore, for some teachers, it was the role of the resource teacher or the speech and language therapist to conduct more detailed assessments of receptive and expressive language skills.

Well you see she'd be taken to the resource teacher who would have more specific work really for her than I would actually do in the classroom. The resource teacher would know this now really much more than me (C410).

He goes to learning support...and he has a language programme from the speech and language therapy as well that he does (C405).

Theme 3: Dealing with Challenges

Some of the challenges recounted by teachers were issues commonly faced by teachers such as class size and classroom management:

Yeah and then of course you're dealing with up to 30 pupils! (C001).

Because in a class the others would give you all the answers and he [DHH child] would be quiet (C011)

As well as that, some teachers noted that their pupils would have benefitted from more concentrated support:

No there probably could be more support I think and when he started, we got the grant to put the speaker system in and that definitely helped, but other than that, no there hasn't been much support. Well like I suppose when he first came like he could really have had more one on one support with a Teacher, it would have greatly helped but just the hours aren't there and so other kids had needs as well that were ahead of him so yeah like I think maybe in the younger years a bit more of a one on one support with a Support Teacher would have been great just to check that he was and where he should be before he'd gone too far (C408).

And I suppose we definitely need the speech therapy and I know they're drastically short on people but she needs not just speech therapy, she needs specialist speech therapy input (C026).

However, the greatest challenge for teachers related to their own perceived lack of knowledge in relation to working with pupils who are DHH:

I've never had a child with hearing difficulties before, now if there was any slight issues before I would have had to take him to the top of the class [to hear me better] but the current situation I have is probably more extreme being that he has the hearing aid and we have the system and the sound system in the classroom. But given his background and everything else you know I can't compare or I don't understand it enough as such, because there's a lot more to it you know (C412).

I have never come across a student with a cochlear implant before so I think I suppose maybe what to put in place, what resources could I put in place that would have helped her a little bit more in the class (C024).

Teachers sometimes expressed surprise at discovering gaps in pupils' skills, which left them feeling somewhat inadequate in their understanding of pupils' needs:

I suppose I felt guilty for one that I hadn't noticed this myself and you know was he struggling with literacy as a result of his hearing impairment that wasn't caught at an early stage - was I doing enough for him? (C001).

I felt that was something that I had just presumed she knew and I kind of found that there were things that I was surprised by. I just took for granted that she would know so I felt that I really didn't have a lot of knowledge of where I would start with [pupil] you know - the starting point I suppose was the thing that I didn't evaluate (C004).

Others expressed a view that they would like to have tests and standards that were designed specifically for pupils who are DHH and not be relying on the tests that are in general use for other pupils in the class:

Yes, well to be honest I'm not too familiar if there are any specific tests for them that the class teacher can do because if there were that would be great because yeah like I don't have anything specific that I'd do just with him to check. It's just whatever he has, has just been the same for everybody else. Maybe yeah just to see because I ask him can you hear me fine where he's sitting and he says he can but sometimes you just don't know. Maybe if there were some more assessments like that yeah (C408).

I suppose it would be nice if you had nearly a layout that you could say this is what we expect this child to be able to do, can he do it? You know kind of a more formal assessment maybe from (what's the right word I'm using?) deaf side of things that if you can do x, y and z you're happy. Yes some sort of guidelines to say yes he has ticked all the boxes from your perspective and he's ticking them from ours as well, you know (C405).

In the case of C405 above, this desire for separate tests suggests that the teacher thought there existed different expectations for DHH pupils in contrast to their hearing peers.

For some teachers, this perceived lack of knowledge was remedied in part with access to support from colleagues, and teachers particularly valued the opportunity to learn specifically about deafness from a qualified professional.

I get great help from the Resource Teacher as well. There's lots of communication between the two of us (009b).

[The visiting teacher] is absolutely brilliant and you know from the word go when this child enrolled and X arrived in to me for a meeting and the principal as well as the class teacher and she arrived in and literally handed me all the forms for all the special education resources and just said sign there and I thought oh my god this is amazing this is so easy (C023).

Many teachers noted that a whole school approach was used, with collaboration across colleagues in meeting the needs of their DHH pupils:

The teacher for the deaf was very good and very helpful but it would have been more about the technology end of things, you know she gave me some information about sounds and things, he was struggling with particular sounds and I would have passed them on then to his learning support teacher (C001).

Well I was so lucky that I could give the additional work to her SNA so that her SNA was there, she also had some cues, some flashcards, she'd prompters in front of her which she required particularly prompters to what she was doing next even little prompters for the order of the day as well. To keep her on track because the SNA was a huge massive assurance for her because the day that the SNA wasn't there she'd be quite lost if the SNA actually leaves the room she'd be looking around "where is the SNA"? (C009a).

[The VT] came and did a training day with the entire staff including the school secretary because in our small school she said "no, no, the secretary needs to know all of this too" and she got the child and his mum to come in to us in the meeting. The class teacher, myself and the secretary went into a separate room with the child and his mum and the VT taught us how to change the battery in his hearing aid (C023).

This access to support from colleagues across the teachers interviewed often made the difference in their own levels of confidence in including a DHH child in their classroom.

You see the thing is, when you have the support, teachers are able to do it once you know there's somebody out there! It's a huge psychological boost as well you know, because as class teachers, none of us were ever trained up to do this but if you get the little bit of support like you can rise to it and you can do it. (C023)

However, some teachers noted that support from colleagues was limited:

[The VT] didn't ask to speak to any of the other teachers that were involved with him and he would have gone out for not just literacy but the small group Maths support as well...It would have been nice to have more specific information relevant to his condition. I didn't go looking for it, maybe it's there but if there is a teacher for the deaf appointed and they come visiting the school perhaps they should come with a list of resources that are available you know point you in the direction of that kind of thing (C001)

the Learning Support Teacher certainly offered as much as she could ...bearing in mind her workload and the other pupils which she had but she certainly offered as much as was possible. But whether to say if that met all the child's needs or not – I cannot say (C009a).

... you don't feel kind of adequately equipped to deal with the child of hearing difficulty unless you actually go and research yourself like, you've to do an awful lot of the work (C024).

I found that I was kind of on my own with setting up things like that so I think that it would have been nice to have a little bit of direction of how you would... yeah the resources that you could use and what would work better for a child with the implant. I think just maybe the history behind it you know what where should she be at, what level should she be at now? It's just kind of I think the information around it and maybe what supports are there and if there was advice I wanted to get who could I contact to just get advice about it? (C402).

Overall, many teachers expressed a view that further professional development was required in order to acquire specific information about the condition and how best to support pupils' learning in terms of what assessments to use and what additional resources would be beneficial to support teaching and learning.

I would think that it would be of great benefit if maybe there was more instruction given to teachers and like that for expressive and receptive language if there was more of guidance as to what the starting point for your pupils who are hard of hearing and even specific structures and resources that maybe could be given to teachers that would maybe help. I found that with [pupil] I had the sound system, I had the FM Comfort Audio but that was it, everything else was what I discovered myself or researched myself (C004).

So I think if you're working with a child with a very specific impairment there should be more availability to attend even if it was a workshop or a course or something to get more specific[information]. Because we are in a vacuum, but there's kind of just no where we can access that you know, there's no course that we could kind of go on to tell us, look you do this and this and that may only work for certain pupils. No it would be great to have some guidelines, it would be great to have some guidelines because we're kind of in the dark (C011).

And I would love if there was some sort of support in place that you could actually go to a course and do a course so you have a child you know that has learning difficulty, I mean any learning difficulty whatever it is whether it's hearing impairment or Autism or whatever you know I don't feel like there are supports in place to be honest (C024).

Well I suppose I'm working on it from a general class point of view and trying to work it out myself but I suppose how I'm supposed to differentiate for her myself so what I'd like is a bit more education for me that's accessible to me you know in my local area, well not local local but like even in [a nearby city] you know (C026).

The fact that quite a number of teachers mentioned their desire to do a course, in spite of the fact that these courses are currently provided through the NCSE, would suggest that there may be problems with the marketing of the continuing professional development routes available to teachers.

Conclusion

Changes in policy at a national and international level mandate that schools provide an appropriate education for all students, including those who are DHH in mainstream settings (Government of Ireland, 1998). The creation of the Visiting Teacher Service in 1972 facilitated, in practice, the integration of DHH pupils in mainstream schools in the Irish context before this policy change. While, in the Irish context, there has been a notable decline in the numbers of DHH pupils attending specialised settings and an increase in those in full mainstream placements, there is a dearth of research examining the educational progress of DHH pupils in Ireland.

Elsewhere, a large corpus of research points to the gap between reading levels of DHH pupils and their age equivalent peers (Powers et al., 1998; Thoutenhoofd, 2006), and it appears that as pupils get older, the gap between them and their hearing peers worsens (Dillon et al., 2012; Geers et al., 2017; Harris & Terlektsi, 2011; Harris et al., 2017a; Kyle & Harris, 2010; Mayer et al., 2016; Thoutenhoofd, 2006; Vermeulen et al., 2007; Walker et al., 1998). Subsequently, the focus of this study was firstly to explore how progress in literacy (reading) for DHH pupils is measured by teachers? Secondly, the study to establish the current literacy (reading) outcomes for a sample of ($n=40$) DHH pupils in primary mainstream schools. In relation to the second question two sub-questions were explored namely – (1) is there a gap between particular sub-skills involved in reading (e.g. reading comprehension and phonological decoding)? (2) what factors are correlated with better reading skills? The following section will summarise the main findings already reported on earlier in this document.

What are the Current Reading Outcomes for the Sample of DHH Pupils in this Study?

To answer this question, pupils were tested using the Edinburgh Reading Test and the Nonword Reading Test. In both tests, DHH students were on average, performing within normal ranges compared with their hearing peers. This research therefore reflects more recent findings on gains being made by DHH children (Archbold et al, 2008; Antia et al., 2009). In particular, the above average ability in the NWRT would suggest that this sample are decoding better than their hearing peers, though the norms in the NWRT are from a British sample. The above average performance in the NWRT among the DHH children in this sample may be explained by the structured approach that teachers took to teaching and assessing phonics on a daily and weekly level, coupled with the fact that many pupils received additional support from the Learning Support/Resource teacher. It might also reflect the input of speech and language therapists and the work done on early spoken language acquisition with this cohort. However, further research may be needed to establish if this phenomenon is unique to DHH children, or if hearing children in the Irish context also demonstrate this skill.

The results from the ERT tests showed that while pupils generally performed less well in this test compared with the NWRT, they were, on average, within the normal range of ability compared with their hearing peers. However, comparison across scores from both tests indicate that there is a disparity between phonological decoding scores and reading comprehension scores, with twice the number of pupils in the study having below average comprehension scores when compared with their phonological decoding scores. Simply explained, the results show that many pupils who are DHH appear to be able to read aloud what is put in front of them to a higher level than they comprehend the text. This phenomenon has not received much attention in the literature. Luckner and Handley (2008) note that there has been less attention given to bottom-up strategies for reading such as decoding and Albertini and Mayer's (2011) study notes that single word reading tests and miscue analysis of read passages may produce different pictures in terms of DHH children's reading ability. This may answer in part why the trend of poorer comprehension than decoding was observed in this study.

Many research studies (Dillon et al., 2012; Geers et al., 2017; Harris & Terlektsi, 2011; Harris et al., 2017a; Kyle & Harris, 2010; Mayer et al., 2016; Thoutenhoofd, 2006; Vermeulen et al., 2007; Walker et al., 1998) report that while DHH pupils may be close to their peers or only a little behind when they are five, six or seven years of age the gap widens as they progress to higher grades. This may be explained by the increase demands on comprehension across many domains. This finding may explain the widening gap that was evident in the reading levels as DHH pupils got older - with increasing demands on comprehension skills – this resulted in with pupils in senior classes, having on average, poorer scores relative to their hearing peers when compared with pupils who are DHH pupils in junior class groups.

Is there a Gap Between Particular Sub-skills Involved in Reading (e.g. reading comprehension and phonological decoding)?

This study supports the finding of a body of research that phonological skills correlate with reading comprehension skills (Trezek et al., 2010), however it raises concerns about pupils who may have excellent phonological decoding skills without an equivalent skill level in comprehension. The test results of the NWRT and the ERT suggest that there is a pattern of considerably better scores in phonological decoding (measured by the NWRT) than in comprehending (measured by the ERT). This finding, which is of concern, raises a key question as to why some pupils had scores above average in phonological decoding while their reading comprehension remained at a lower level. The answer to this question lies in our understanding of what skills are necessary in order to comprehend fully what is read and understood. Research clearly indicates that comprehension can and should occur from the earliest years. Pupils need to be both code breakers and meaning makers, utilising both word-level and text-level skills in the construction of meaning. Shanahan et al. (2010) identify six areas of knowledge and skill considered to be crucial in the development of comprehension among young readers, namely: word-level skills; vocabulary knowledge and oral language skills; broad conceptual knowledge; knowledge and abilities required specifically to comprehend a text; thinking and reasoning skills and motivation to understand and work towards goals. Effective comprehension instruction must draw on and develop pupils' concepts, dispositions and skills in each of the above areas.

It is clear that teachers in this study placed a strong emphasis on teaching and assessing phonics and word attack skills with the predominant emphasis being placed on developing literacy skills at word level – this reveals a bottom up approach as described by McPhillips & Shevlin (2009). While there was a clear understanding of what comprehension entailed, there is little evidence from the data collected that explicit comprehension instruction practice took place. This is evidenced in the surprise experienced by teachers in relation to the gap between the pupils' apparent reading ability (through reading aloud) and their performance on formal assessments with teachers believing that they had higher standards.

What factors are correlated with better reading skills?

Better socio-economic backgrounds have been shown to influence later reading achievement (Geers, 2003; McDonald Connor & Zwolan, 2004). Findings from this study support these findings in that parental income (often used as a contributor to socio-economic status) was the only family-related variable shown to have a statistically significant relationship with pupils' test scores on the ERT test. The impact of cochlear implants has been the focus of much research with the expectation that early cochlear implantation will support better literacy outcomes for pupils who are DHH (Johnson & Goswami, 2010), however in this study the findings indicate that pupils using hearing aids performed better on the NWRT assessment than pupils with cochlear implants. The poorer performance of pupils with cochlear implants (CIs) versus those with hearing aids on the NWRT is likely to be a function of their more severe levels of hearing loss. Unfortunately, data were not available on the age of implantation of all of the pupils using CIs in this sample. Earlier identification and implantation of pupils has been shown to result in improved phonological awareness (Johnson & Goswami, 2010) though the benefits of cochlear implantation seen in early years needs to be monitored as pupils' progress through their schooling since the longitudinal findings as pupils get older are less favourable (Archbold et al., 2008).

How is Progress in Reading for DHH Pupils Measured by Teachers?

Except in one case, all teachers interviewed as part of this study said that their pupils were included in the formal assessments with the tests most frequently used being the Drumcondra and the Micra T. These tests were administered at the end of the year for pupils in 2nd, 4th and 6th classes with results being reported to the Department of Education and Skills (DES). Some teachers also used a range of other formal standardised tests to monitor progress in reading. Other informal tests took place including weekly tests in spelling and phonics and word recognition. However, it was noted overall that teachers were more regularly assessing skills relating to decoding than skills relating to comprehension or language, and they were more likely to name structured methods of assessing the former skill set. Phonological awareness is a critical sub-skill required in becoming a successful and fluent reader. However, it is important to note that success in word reading and non-word decoding (both skills directly linked to phonics) may not result in improved comprehension skills

(Trezek & Wang, 2006). This points to the fact, as was evident in this study, that an emphasis in teaching and assessment on the mechanics of phonics can lead to improvements in some skills relating to reading, but does not necessarily help with overall reading comprehension – especially if underlying language skills are not developed. In this study, teacher-interviews indicated that the assessment of phonics and word recognition was more regular and more structured than the assessment of reading comprehension or of underlying language ability. This reflects earlier findings in the Irish context on instruction (rather than assessment) of comprehension showing that despite widespread recognition of the importance of developing pupils' literacy skills and in particular the development of metacognitive reading comprehension strategies, teachers rely heavily on decoding instruction while explicit comprehension instruction is not practiced as a rule (Concannon-Gibney and Murphy, 2012).

Reading involves the mastery of a range of language skills – at both receptive and expressive levels. Success in reading is closely aligned with successful language ability in DHH children (McDonald Connor & Zwolan, 2004), regardless of modality i.e. whether the first language ability is signed or spoken (Lederberg et al., 2013) or a combination of both (Spencer et al., 2003). However, since spoken English is not always readily accessible to DHH pupils because of their hearing loss, many DHH pupils at school age present with language delay. The findings from this study point to the fact that while there was awareness of gaps in both receptive and expressive language – teachers took an informal approach in assessing pupils' receptive and expressive language skills, with some expressing confusion as to what this entailed. Others saw this level of assessment as the remit of the Learning Support/Resource teachers or of Speech and Language Therapists.

Owing to the difficulties with language acquisition faced by DHH pupils (noted above), it is important that teachers recognise and assess accurately pupils' individual language skills and competencies in order to establish an appropriate starting point for further structured language development. As teachers in this study frequently expressed difficulty in knowing what levels pupils were at in relation to assessing their receptive and expressive language skills – the new structured approach to assessment detailed in the Primary Language Curriculum (2018) will serve as a significant support to teachers in accurately profiling pupils' language skills and competencies.

Acknowledging the central importance language plays in all aspects of education, the NCCA have recently launched a new *Primary Language Curriculum* (2018) which integrates the teaching of languages- English and Irish – and addresses the language and literacy needs of all pupils across a wide spectrum of developmental need and ability level. The *Primary Language Curriculum* aims to help teachers to support pupils in developing a positive attitude to learning language and to developing competent literacy skills. While the language experiences of pupils, teachers and schools vary greatly across the different school contexts, for each strand - oral language, reading and writing - all teachers will now be in a position to make professional judgements on the pupils' starting point by looking at the Learning Outcomes for the relevant stage and the Progression Milestones and Progression Steps linked to these Learning Outcomes on the Progression Continua which offer samples of pupils' language learning. This detailed structure and examples will address the call from teachers in this study for more guidelines in how to assess both receptive and expressive language for pupils who are DHH.

The *Primary Language Curriculum* (NCCA, 2018) advises that comprehension strategies should begin in the early years and involves an interaction between the reader, the context and the text as the reader simultaneously attempts to comprehend, extract and construct meaning while engaging in the comprehension process. "Extracting meaning" they note "simply means understanding what an author has stated, explicitly or implicitly. Constructing meaning means interpreting what an author has said by bringing the learner's capacities, abilities, knowledge and experience to bear on what he/she is reading" (NCCA, 2018a, p.1)

In keeping with the model of effective comprehension strategies advised by Pearson and Gallagher's (1983), the NCCA advise on the gradual release of responsibility with the teacher initially taking responsibility to teach and model key comprehension strategies, moving on to shared and collaborative engagement to finally pupils becoming independent in applying the strategies against their own schema (Anderson & Pearson, 1984; Narvaez, 2002) or world knowledge (Fletcher, 1994).

The greatest challenge for teachers in relation to assessment of literacy for DHH pupils related to a perceived lack of knowledge of approaches to assessment that could be used throughout the year and the expected norms or standards that DHH pupils should attain. Teachers expressed surprise at discovering gaps in pupils' comprehension abilities or in their general knowledge, which left them feeling somewhat inadequate in their

understanding of pupils' needs. This may be as a direct result of the emphasis on decoding and phonological awareness to the detriment of comprehension and underlying language abilities. In turn, they expressed a view that having specific tests for DHH pupils would ensure that they would not miss out on the gaps in pupils' learning, that they now were laterally discovering.

Limitations of the Study

While this study offers significant insights into the assessment of literacy (reading) outcomes for DHH pupils however, as the sample size was small – findings cannot be generalised to the whole population of DHH pupils. Furthermore, it became apparent in analysing the demographic information collected from families involved in this study that self-selection bias may have come into play. Families were more educated and from higher income backgrounds than the national average. The findings of this study may not, therefore, reflect outcomes for a more diverse sample of children. Pupils' dates of birth were not sought prior to testing, this resulted in 5 pupils outside the upper age range of the ERT level 3 (ERT levels 1-3 - 7:0 to 12:6 years). While, testing proceeded with these pupils and reading ages were calculated as per the manual, standard scores could not be calculated. The issue of access to this pupil cohort proved to be a difficult and arduous journey which took considerable time, effort and endurance by the researchers. It is advised that an easier access route be explored so as to further this research and to extend the pupil sample. The lack of access to the perspectives of the Visiting Teacher Service was regrettable as it was considered that their experience would have added another rich layer to the whole research question.

Recommendations for Future Study

- It is recommended that the assessment of additional literacy sub skills namely, reading fluency, rate and accuracy and a more detailed examination on the differences in literal and inferential comprehension for DHH pupils be addressed in a further research study.
- It is suggested that in future studies, the perspectives of DHH pupils on their own progress in literacy could add value and insights not presented in this study.
- It is recommended that the Visiting Teacher Service be included in further research studies in this area.
- It is recommended that a replica study with an older cohort of DHH pupils be carried out.
- It is recommended that consideration be given to a national longitudinal study to monitor progress and outcomes for DHH children over time, in particular in the wake of policy and practice changes such as neonatal screening, bilateral implantation, and the Irish Sign Language Act 2017.

Recommendations for Practice

- It is recommended that teachers working with DHH pupils closely assess and monitor their progress in language acquisition, both receptive and expressive.
- It is recommended that the intensive instruction in phonics and word-level decoding currently taking place be balanced with more direct instruction on reading comprehension strategies with DHH pupils.
- It is recommended that where DHH pupils are not meeting expectations in reading attainment that diagnostic assessments be used to identify the area of reading in need of development. The diagnostic assessments chosen should incorporate sentence and passage level reading at both literal and inferential levels.
- Pupil progress should be monitored closely over time, in particular as they approach the more senior classes in primary school where the gap between them and their hearing peers can begin to widen.
- It is suggested that an online module be developed to support the professional needs of teachers as identified in the study and that follow on research would examine the impact of this support on teachers' practices with respect to assessing literacy outcomes for DHH pupils.

Appendix 1 Interview Schedule: Class Teachers

I am interested **only** in the assessment practices that you use in **relation to pupil who is Deaf/HH**.

1. Firstly, for you, what does reading comprehension involve?
(prompt questions)
What do you do to get meaning from text?
How do you understand/make sense of/interpret text?
2. Are you satisfied with X's level of progress in achieving the learning outcomes for literacy as a X class pupil?
3. If **not** what do you do when you notice that they are falling behind?
4. What aspects of literacy do you assess on a regular basis?
5. Do you assess the pupils' **receptive language** skills (explain), How?
6. Do you assess the pupils' **expressive language skills**? (explain), How?
7. Do you assess the pupils' word recognition? How?
8. Do you assess the pupils' word fluency? How?
9. Do you assess the pupils' phonics? How?
10. Do you assess the pupils' comprehension? How?
11. What formal assessments do you use?
12. How often would you use these?
13. Do you have to adapt these tests for Deaf/HH pupils?
14. [Where appropriate, depending on class of pupil] Are assessment results reported for this child in the returns for the Department of Education, or is there an exemption in place?
15. What support have you received in helping you to assess literacy outcomes for X, has this level of support been adequate?
16. Do you communicate assessment results to parents, and how often?
17. Is there anything that you would like to add about issues to do with assessment of literacy for pupils who are deaf/ HH?

Appendix 2 – Parent Survey

The purpose of this questionnaire is to gather information on language and literacy practices with Deaf and Hard of Hearing children in the home. Some background questions are also included. This questionnaire will take approximately 20 minutes to complete. Please answer these questions in relation to your Deaf/Hard of Hearing child. If you have more than one Deaf/Hard of Hearing child, please answer regarding the child involved in this study. PLEASE NOTE: Your completion of this questionnaire confirms that you understand the purpose of this study and that you freely consent to participate in it. **Tick the box to complete the questionnaire, except where you are asked for further information.**

PART 1: ABOUT YOU AND YOUR CHILD					
1 What is your relationship to the child in this study:					
	Mother (either biological or adoptive)	<input type="checkbox"/>			
	Father (either biological or adoptive)	<input type="checkbox"/>			
	Other (please specify):				
2 What age are you?					
	25 or younger	<input type="checkbox"/>		36-40	<input type="checkbox"/>
	26-30	<input type="checkbox"/>		41-45	<input type="checkbox"/>
	31-35	<input type="checkbox"/>		46 or older	<input type="checkbox"/>
	Other (please specify):				
3 In years and months, what age is your child involved in this study?					
	Years:		Months:		
4 What is your hearing status?					
	Deaf	<input type="checkbox"/>		Hearing	<input type="checkbox"/>
	Hard of hearing	<input type="checkbox"/>			
	Other (please specify):				
5 What is the highest level of schooling you have completed:					
	Did not complete primary school	<input type="checkbox"/>		Post-leaving cert course	<input type="checkbox"/>
	Primary school	<input type="checkbox"/>		Diploma/Certificate/ Pass degree	<input type="checkbox"/>
	Junior cert/inter cert/ group cert	<input type="checkbox"/>		Honours degree	<input type="checkbox"/>
	Leaving cert	<input type="checkbox"/>		Postgraduate	<input type="checkbox"/>

6 Do you use a language other than English in the home as your main mode of communication? Main mode of communication here means the language you use to converse on a day-to-day basis between most members of your household. If, for example, you speak French with your partner and hearing children, select Yes – French for this question.

Yes (see part b of this question)	<input type="checkbox"/>	No (skip to question 7)	<input type="checkbox"/>
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6b Please indicate what language is used at home other than English as the main mode of communication (please select one):

Gaeilge	<input type="checkbox"/>	Lithuanian	<input type="checkbox"/>
Irish Sign Language	<input type="checkbox"/>	German	<input type="checkbox"/>
Polish	<input type="checkbox"/>	Russian	<input type="checkbox"/>
Other spoken language (specify)			
Other sign language (specify)			

7 If you were to add up all the sources of income you have in your household (all salaries, social welfare benefits, etc, after tax), what bracket would your net household income fall into?

Under €12,000	<input type="checkbox"/>	€42,001-€48,000	<input type="checkbox"/>
€12,001-€18,000	<input type="checkbox"/>	€48,001-€60,000	<input type="checkbox"/>
€18,001-€24,000	<input type="checkbox"/>	€60,001-€78,000	<input type="checkbox"/>
€24,001-€30,000	<input type="checkbox"/>	€78,001-€96,000	<input type="checkbox"/>
€30,001-€42,000	<input type="checkbox"/>	€96,001 or more	<input type="checkbox"/>

8 What level of deafness has your child?

Profound	<input type="checkbox"/>	Moderate	<input type="checkbox"/>
Severe	<input type="checkbox"/>	Mild	<input type="checkbox"/>
If you know your child's decibel level loss, write it here:			

8b Is your child deaf in one ear or both ears?

One Ear	<input type="checkbox"/>	Both Ears	<input type="checkbox"/>
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8c Does your child routinely use any of the following devices:

My child doesn't use any amplification	<input type="checkbox"/>	Cochlear implant (CI)	<input type="checkbox"/>
Hearing aids	<input type="checkbox"/>	Unilateral (one CI)	<input type="checkbox"/>
		Bilateral (two CIs)	<input type="checkbox"/>
Other (please specify):			

PART 2: LANGUAGE AT HOME WITH YOUR CHILD

9 Does your child use spoken language for communication? Please select:

Yes

No

10 Does your child avail of speech and language therapy services?

Yes, and still does.

No, we are on a waiting list.

Yes, in the past but not anymore.

No, never.

11 Do you do activities at home to develop spoken language with your child? E.g. use speech and language therapy exercises, work on speech sounds, practice auditory-verbal exercises, etc.

Yes (Please answer part b)

No (Skip to the question 12)

11b How much time do you spend on these activities?

More than 1 hour every day

Up to 1 hour every week

Up to 1 hour every day

Very little time

More than 1 hour every week

12 Using a rating scale SD: strongly disagree, D: disagree, U: undecided, A: agree, SA: strongly agree, please respond to the following statements about your experience of encouraging spoken language development with your child. Please circle.

My child's class teacher is supportive

SD

D

U

A

SA

Speaking English is necessary for my child's educational development.

SD

D

U

A

SA

I have, at least once, been recommended not to speak with my child.

SD

D

U

A

SA

Speech is important because my child is a member of the local community.

SD

D

U

A

SA

Speaking is necessary for my child's social development.

SD

D

U

A

SA

My child's visiting teacher supports me in using speech with my child.

SD

D

U

A

SA

13 Are you familiar with the Irish Sign Language home tuition grant?

Yes

No

13b Do you now, or have you ever availed of the Irish Sign Language home tuition grant?

Yes, and still do.

No, never.

Yes, in the past but not anymore.

14 Does your child use Irish Sign Language for communication?						
No, never. (Skip to PART 3)	<input type="checkbox"/>	Yes, and still does.				<input type="checkbox"/>
Yes, in the past but not anymore.	<input type="checkbox"/>					
If you have stopped, please state why:						
15 Have you, as a parent, ever attended adult classes in Irish Sign Language e.g. evening classes?						
Yes, and still do.	<input type="checkbox"/>	No, never.				<input type="checkbox"/>
Yes, in the past but not anymore.	<input type="checkbox"/>					
16 Does your child now, or has he/she ever, availed of Irish Sign Language support at school, either from a teacher or a Special Needs Assistant?						
Yes, and still do.	<input type="checkbox"/>	No, never.				<input type="checkbox"/>
Yes, in the past but not anymore.	<input type="checkbox"/>					
17 Using a rating scale SD: strongly disagree, D: disagree, U: undecided, A: agree, SA: strongly agree, please respond to the following statements about your experience of using Irish Sign Language (ISL) with your child. If a statement is not applicable, please skip it. Please circle.						
My child's class teacher is supportive.	SD	D	U	A	SA	
ISL is beneficial for my child's <u>educational</u> development.	SD	D	U	A	SA	
I have, at least once, been recommended not to use ISL with my child.	SD	D	U	A	SA	
ISL is important because my child is a member of the Deaf Community	SD	D	U	A	SA	
ISL is beneficial for my child's <u>social</u> development.	SD	D	U	A	SA	
My child's visiting teacher supports me in using ISL with my child.	SD	D	U	A	SA	
18 People have different opinions on what Irish Sign Language is. Please use this space to tell me what you understand Irish Sign Language to be:						

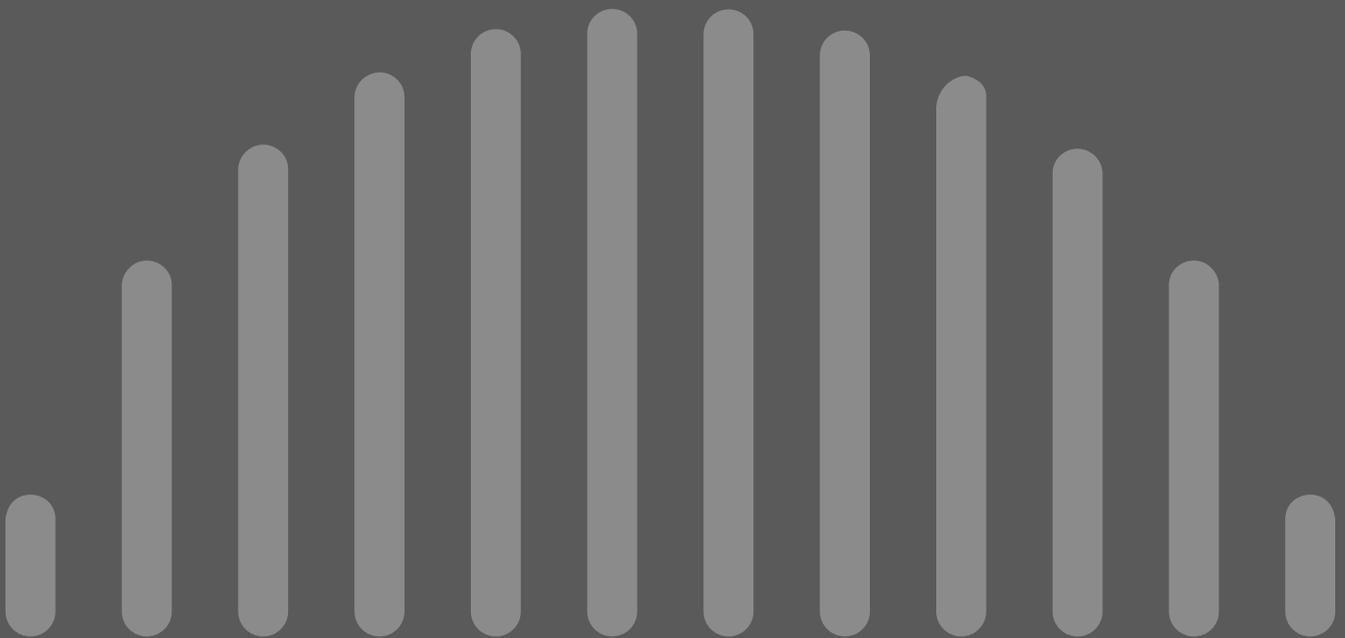
PART 3: READING AT HOME WITH YOUR CHILD

19 About how many children's books does your child have access to in your home now, including any library books? Would you estimate:						
	None <input type="checkbox"/>	21 to 30 <input type="checkbox"/>				
	Less than 10 <input type="checkbox"/>	More than 30 <input type="checkbox"/>				
	10 to 20 <input type="checkbox"/>					
20 Do you use the public library for your child?						
	Yes <input type="checkbox"/>	No <input type="checkbox"/>				
21 In the past month, have you tried to read a book to your child?						
	Yes <input type="checkbox"/>	No <input type="checkbox"/>				
21b If yes, do you read in:						
	English (spoken only) <input type="checkbox"/>	Irish Sign Language (ISL) only <input type="checkbox"/>				
	English (supported with signs) <input type="checkbox"/>	Other (please specify) <input type="checkbox"/>				
	Spoken language other than English <input type="checkbox"/>					
21c If yes, approximately how often have you read a book with your child in the past month?						
	Every day <input type="checkbox"/>	More than 3 times in the month <input type="checkbox"/>				
	More than 3 times a week <input type="checkbox"/>	Less than 3 times in the month <input type="checkbox"/>				
	Less than 3 times a week <input type="checkbox"/>	Never <input type="checkbox"/>				
22 Using a rating scale SD: strongly disagree, D: disagree, U: undecided, A: agree, SA: strongly agree, please respond to the following statements about your experience of reading a book with your child. Please circle.						
	Reading with my child is an enjoyable experience.	SD	D	U	A	SA
	I feel confident that I can read with my child.	SD	D	U	A	SA
	I feel confident that my child understands me when I read.	SD	D	U	A	SA
	Reading is an important activity to do with my child.	SD	D	U	A	SA
	I find it difficult to read with my child.	SD	D	U	A	SA
	It is more difficult to read to a deaf child than a hearing child.	SD	D	U	A	SA
	Reading with my deaf child is an activity I will do a lot.	SD	D	U	A	SA

The questionnaire is now complete. Thank you for your time.

Please return the questionnaire in the stamped addressed envelope enclosed. If you wish to add any additional information which has not been included above, please include an additional sheet.

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