Institution: University of Reading

Unit of Assessment: 4 Psychology, Psychiatry and Neuroscience

Title of case study: A standardised test of young children's understanding and production of language

1. Summary of the impact

Language impairment is common in children and, without effective early intervention, presents a risk for educational, social and emotional disturbance. The team used their considerable experience in child language research to produce a novel assessment of child language development – The Reynell Developmental Language Scales 3 (RDLS3) - the first test of child language development to be standardised in the U.K. to assess both understanding and production of language in young children. Use of the test has improved language assessment and diagnosis for children with language impairments and, as such, has enabled health and education professionals to target therapy and monitor the effectiveness of interventions to improve child language development. The test has been widely used in the U.K. and is now also being used widely internationally. Recent research by the team has informed a revised version of the test - The New Reynell Developmental Language Scales (NRDLS). Sales figures of the RDLS3 and the commissioning of the NRDLS are testament to its outstanding reputation and enduring legacy worldwide.

2. Underpinning research

The impact was underpinned by two phases of research conducted by members of the School of Psychology and Clinical Language Sciences at the University of Reading.

Prior to the REF period, research by the team included (i) the construction of a developmental profile of lexical and grammatical development in preschool children (Crystal, Fletcher & Garman, 1989; Edwards et al., 1992); and (ii) grammatical analyses of the spoken language in individuals at risk from language impairment, identifying difficulties in the use of auxiliary verbs and verb inflections among children with language impairment (Fletcher & Peters, 1984), and limitations on temporal adverbial usage in these children (Fletcher and Garman, 1988). This research highlighted a number of key features to be included in the test in order to provide a thorough, developmentally sensitive assessment of language development in children, including the comprehension and expression of both single words and increasingly complex grammatical structures. Accordingly, targets for assessment were selected and procedures created to measure language development in children from 1.5 to 7 years of age.

The first phase of research within the REF period involved the piloting of assessment procedures and standardisation of the RDLS3 language development test between 1995 and 1997. Clinicians working with language impaired children were consulted in order to identify the assessment procedures that were most effective and informative about a child's understanding and production of key language features. Early versions of the RDLS3 were trialled on 400 typically developing children and the most discriminating measurement items were selected for the final version. Validation and standardisation of the test was then conducted using a cohort of 1,074 typically developing children recruited from a wide range of socio-economic backgrounds and geographical locations within the UK and the Republic of Ireland (1, 2). On the basis of this research a comprehensive test of child language based on developmental norms (the RDLS3) was published in 1997. The publication included instructions, examples, case studies, technical details and user friendly tables giving percentiles, standard scores and age equivalents for typically developing children between 1.5 and 7 years of age. All metrics were based on a large representative sample of children from the U.K. and Republic of Ireland (1, 2).

The second phase has involved language development research conducted within the School of Psychology and Clinical Language Sciences since the publication of the RDLS3 and has contributed to a further revision of the test (the New Reynell Developmental Language Scale or NRDLS, 2011; 3). Specifically, the development of the test was influenced by normative data for vocabulary development based on work by Schafer in the Reading team with colleagues at the University of Oxford (4). The recent revision of the test includes specific considerations for

assessing multilingual children, influenced by research at the University of Reading describing patterns of language delay among children where English is not their primary language (5, 6). On the basis of these and other new developments in language development research, the NRDLS was revised, piloted and then standardised with 1,266 typically developing children aged 2 to 7.5 years (3, 7, 8). The NRDLS was published in 2011 and provides instructions, examples, case studies, technical details and user friendly tables giving percentiles, standard scores and age equivalents for typically developing children between 2 and 7.5 years of age based on a large representative sample of English children.

Researchers:	Title in REF period (Dates employed)	Researchers:	Title in REF period (Dates employed)
Susan Edwards	Lecturer- Professor (1984-2010)	Carolyn Letts	Lecturer (1986-1999)
Paul Fletcher	Professor (1973-1995)	Indra Sinka	Research assistant/Lecturer (1991-1998)
Michael Garman	Professor (1971-2006)	Graham Schafer	Lecturer- Snr Lecturer (1997-present)
Arthur Hughes	Senior Lecturer (1974-1998)	Theo Marinis	Lecturer-Professor (2005-present)

2. References to the research

1. Edwards. S., Fletcher, P., Garman, M., Hughes, A., Letts, C. & Sinka, I.: The Reynell Developmental Language Scales III. The University of Reading Edition. NFER-Nelson. Chiswick, London, 1997. *Report of test development and manual. Produced following successful competitive tender to NFER-Nelson (£84,000; 1995-1997).*URL: http://reynell.gl-assessment.co.uk/

2. Edwards, S., Garman, M., Hughes, A., Letts, C. & Sinka, I. (1999) Assessing the comprehension and production of language in young children: an account of the Reynell Developmental Language Scales III. International Journal of Language and Communication Disorders, 34, 151-171. URL: http://www.ncbi.nlm.nih.gov/pubmed/15587011. *Peer reviewed journal article in journal of the Royal College of Speech and Language Therapists and deemed to be of at least 2* quality. Funded by competitive tender to NFER-Nelson (£84,000; 1995-1997).*

3. Edwards, S., Letts, C., & Sinka, I. (2011).The New Reynell Developmental Language Scales. GL Assessment Limited. Chiswick, London. *Report of test development and manual. Commissioned by Granada Learning Assessment(£300,000; 2008- 2011)* URL: http://reynell.gl-assessment.co.uk/

4. Hamilton, A., Plunkett, K., & Schafer, G. (2000). Infant vocabulary development assessed with a British Communicative Development Inventory. Journal of Child Language, 27, 689-705. URL: http://centaur.reading.ac.uk/4542/1/Hamilton.Plunkett.Schafer.pdf *Peer reviewed journal articleand deemed to be of at least 2* quality. Web of Science citations (November 2013): 93.*

5. Marinis, T. & Chondrogianni, V. (2010). Production of tense marking in successive bilingual children: when do they converge with monolingual peers? International Journal of Speech-Language Pathology, 12, 19-28. DOI: 10.3109/17549500903434125. *Peer reviewed journal article, deemed to be of at least 2* quality. Funded by ESRC Grant to Marinis (£321,916, 2007-2010; 'Real-time processing of syntactic information in children with English as a Second Language & children with Specific Language Impairment'.)*

6. Marinis, T. & Chondrogianni, V. (2011). Comprehension of reflexives and pronouns in sequentially bilingual children: do they pattern similarly to L1 children and L2 adults or children with specific language impairment? Journal of Neurolinguistics, 24, 202-212. DOI: 10.1016/j.jneuroling.2010.02.009. *Peer reviewed journal article and deemed to be of at least 2* quality. Funded by ESRC Grant to Marinis (as above).*

7. Letts, C., Edwards, S., Schaefer, B., & Sinka, I. (2013). The New Reynell Developmental

Language Scale (NEDLS): Descriptive account and illustrative case study. Child Language Teaching and Therapy. DOI: 10.1177/0265659013492784. *Description of test development and application. Peer reviewed journal article and deemed to be of at least 2* quality. Funded by Granada Learning Assessment (as above).*

8. Letts, C., Sinka, I., Schaefer, B., & Gibbons, W. (2013). Socio-economic status and language acquisition: children's performance on the new Reynell Developmental Language Scales. International Journal of Language and Communication Disorders, DOI: 10.1111/1460-6984.12004. *Description of test development and application. Peer reviewed article in journal of the Royal College of Speech and Language Therapists, deemed to be of at least 2* quality. Funded by Granada Learning Assessment (as above)*.

4. Details of the impact

Approximately 7% of pre-school children have language impairments (e.g. Tomblin et al., 1997), which translates to about 40,000 children who are starting school in the U.K. each year, with over 5,000 of these children having severe and complex speech and language difficulties (Bercow, 2008). The ability to communicate underpins children's social, emotional and educational development, and those who do not benefit from early intervention are at increased risk of educational underachievement, emotional and behavioural problems, and poorer employment prospects (Bercow, 2008). It is therefore, essential, that appropriate tools exist to identify and diagnose specific speech and language difficulties in early childhood and to monitor the effects of intervention. The international reputation of the University of Reading team's research on typical and atypical language development [1], led to an invitation to enter a competitive tender to produce a new language test using the brand name *Reynell* (an author of an earlier language test) with the publishers NFER-Nelson, a leader in the fields of health and education. The team's successful bid led NFER-Nelson to commission the piloting and standardisation of the test and a reliable assessment tool was subsequently produced for use in clinical practice. The test was unique in that it included measures to assess the acquisition of key components of linguistic structure, reflected advances in understanding the development of child language (based on the team's underpinning research), tested both comprehension and expression, was developed in the U.K. and provided reliable norms of young children's language based on a large representative sample of children from the U.K. and Republic of Ireland. Prior to the development of this test, Speech and Language Therapists (SLTs) in the U.K. and Republic of Ireland did not have access to an assessment that provided robust normative scores for both language comprehension and expression to guide clinical decision making [2]. The test also provided clinicians with a standard for monitoring the effectiveness of educational or medical intervention or building profiles of specific clinical populations. Thus, the publication of a valid, standardised test of language development contributed to language assessment of children, improved diagnosis, enabled clinicians to target intervention, provided a means of calibrating effectiveness, and provided a reliable tool for researchers measuring language change [2].

Members of the research team (Susan Edwards and Carolyn Letts) led workshops across the U.K. for health and education workers to promote the test and offer training for potential users on the purpose and administration of the test scales. Furthermore, the team were invited to author a lead article for the journal of the Royal College of Speech and Language Therapists, the *Journal of Language and Communication Disorders*, and the authors gave presentations and workshops at professional meetings in Norway, the Netherlands, New Zealand, Greece, Germany, Canada, Hong Kong, Iran, Kuwait and the U.S.A.

The beneficiaries of this work have been children with language impairment, their parents, clinicians (SLTs and related professionals), and health and education authorities. Wide and varied use of the test is indicated by the large number of publications that cite the test within clinical contexts [3], including evaluation of interventions for young children who stammer, and also children from disadvantaged backgrounds. Other populations where the test has been used include children with Down's syndrome, pervasive developmental disorder, developmental delay, hearing impairments, cochlear implants, and also children on the autistic spectrum [4].

In line with the expansion of evidence-based interventions for language impairment and associated

conditions in the NHS, and in response to demands for SLTs to provide scores from robust language testing during legal proceedings, SLTs are increasingly required to justify their diagnoses and demonstrate effectiveness to their funders (educational and/or health authorities). The robust underpinning research and psychometric properties of the test have, therefore, made it the test of choice for SLTs and related professionals [2] and this preference is reflected in the high volume of sales of the test [5]. Since its publication 5,259 copies of the RDLS3 have been sold. As a test record form is required for each administration of the test it is notable that 371,835 RDLS3 record forms have been sold (in addition to the 25 forms that come with each test kit) giving a clearer illustration of the number of children who have actually been tested. Despite tests sold prior to the REF period still being in use, sales have continued to be high in the U.K. and increasingly overseas during the REF period. Since 2008, 20,845 additional record forms have been sold, with about a third of these sold overseas (6,080). In fact most of the tests that been sold during the REF period have been to overseas users (301 of 329 tests) [5]. The test has also been translated for use by overseas clinicians (it is now available in, e.g. Finnish, Norwegian, Dutch and Malay) and it has also been used within clinical research in countries including Sweden and Israel [6], providing a resource for language assessment and diagnosis for children with language impairments with substantial international reach.

As a result of the success of the RDLS3, in 2008 Susan Edwards (with Carolyn Letts (now at Newcastle University) and Indra Sinka (now at Open University)) were commissioned by Granada Learning (GL) Assessment (£300,000) to develop a new, re-standardised edition of the test, the New Reynell Developmental Language Scales (NRDLS; published 2011 [1]). Sales of this new test have already reached 650 tests (plus a further 5,375 record forms), with 105 tests being sold in the EU and 163 in other parts of the world. The substantial ongoing sales of the record forms and the commissioning of a revised version of the test are testament to its outstanding reputation and enduring legacy.

5. Sources to corroborate the impact

Where examples are given below full lists are available on request.

[1] To corroborate influence of underpinning research- see test manuals for cited references to underpinning research:
Edwards. S., Fletcher, P., Garman, M., Hughes, A., Letts, C. & Sinka, I.: The Reynell Developmental Language Scales III. The University of Reading Edition. nferNelson. Chiswick, London, 1997.
Edwards, S., Letts, C., & Sinka, I.The New Reynell Developmental Language Scales. GL Assessment Limited. Chiswick, London, 2011.
http://reynell.gl-assessment.co.uk/

[2] To corroborate the utility of the test for Speech and Language Therapists- former Chair, Royal College of Speech and Language Therapists and Director of Speech and Language Therapy Unit

[3] Example to corroborate wide clinical contexts in which the test has been used:
http://onlinelibrary.wiley.com/doi/10.1046/j.1365-2214.2002.00270.x/full

[4] Example to corroborate wide range of developmental disorders with which the test has been used: http://onlinelibrary.wiley.com/doi/10.1111/j.1469-7610.2004.00377.x/full

[5] Sales figures available from Granada Learning Assessment

[6] Example to corroborate translations and papers demonstrating use with range of clinical populations internationally:
http://www.sciencedirect.com/science/article/pii/S1750946712000293