Innovation in Assessment & Teaching

Introducing the Trinity Early Screening Test in
Reading & Writing (TEST2r)

Dr Pauline M Cogan
Structure of Presentation

- Background to TEST2r:
  - Need (Policy & Practice)

- Theoretical Bases & Development of TEST2r

- TEST2r Structure - 7 Factors (Building Blocks of Literacy)

- Elements of TEST2r

- Roll-out of TEST2r
Need (Policy)

Department of Education & Skills (2011) Literacy & Numeracy for Learning & Life:

Based on earlier reports e.g.

- Report of the Task Force on Dyslexia (DES, 2002)
- Assessment in the Primary School (NCCA, 2008)
- Aistear (NCCA, 2009)

All reports above emphasise the importance of classroom based formative assessment in the early stages of learning.
Need (Practice)

Desirability of Early Screening

Desirability of Early Intervention

- less ground to make up
- problems are less complex
- better educational prospects
- near-normal scholastic achievement
- enhanced quality of life
- access to full curriculum
- more cost-effective
The Power of Early Intervention

“When the diagnosis of dyslexia was made in the first two grades of school, nearly 82% of students could be brought up to their normal classroom work, while only 46% of the dyslexic problems identified in third were remediated and only 10% to 15% of those observed in grades five to seven could be helped when the diagnosis of learning problems was made at those grade levels” (Strag, 1972, p.52).
TEST2r

- Designed to identify those 5 & 6 year old children who are at risk of literacy failure.

- Based on research literature of:
  - Normally developing emergent literacy
  - Reading research literature
  - Dyslexia research literature
  - Language in relation to literature
  - Memory (Long Term, Short Term and Working Memory)
Based on Theories of Dyslexia

- Phonological Deficit Hypothesis (PDH)
- Working Memory Deficit Theory
- Double Deficit Hypothesis (DDH)
- Magnocellular Deficit Hypothesis (MDH)
- Cerebellar Deficit Hypothesis (CDH)
Phonological Deficit Hypothesis (PDH)

- PDH argues that (some) children at risk of dyslexia are born with an insensitivity to the phonic structure of their mother tongue.
  - Knock-on effect is that exclusive teaching of phonics is probably the wrong method of literacy acquisition for them (whole word method is probably better with very gradual introduction to phonics).

- PDH includes the idea that children at risk for dyslexia also have a poor short term or working memo (all point to phonics as unsuitable method for these children).
Triangular Model of Reading

TOP DOWN

Context Processor

TOP DOWN

Semantic (Meaning) Processor

Phonological Processor

Orthographic Processor

BOTTOM UP

Slow
Additive
No meaning
Below word level
Reliant on WM

Fast
Complete
Meaning
Word level
Structure of Working Memory

- Visuo-spatial scratch pad
- Central Executive Function
- Articulatory loop (Rehearsal)
TEST2r

Double Deficit Hypothesis (DDH)

DDH argues that a children at risk of dyslexia can experience:

a. A phonological insensitivity

OR

b. Poor ability to rapidly access the name of objects, colours, shapes, numbers, etc. in Long Term Memory

c. Some unfortunate children have both deficits (DDH)

• difficult to remediate
Magnocellular Deficit Hypothesis (MDH)

MDH argues that the large (magno) -cells in various body systems (hearing, sight, touch, balance) are numerically and structurally disordered leading to literacy problems.

• processing of fast sound transitions compromised
Cerebellar Deficit Hypothesis (CDH)

CDH argues that children at risk of dyslexia have a structurally disordered cerebellum and disordered brain connections which lead to literacy problems. Affected children cannot easily build up reading and spelling skill to automatic levels because the cerebellum is involved in making all processes automatic.
Development of TEST2r

- Large number of tests designed

- Pilot Study Database created (100 children in 20 schools)
  - floor/ceiling effects
  - test/retest reliability

- detailed reliability of subtests and suitability of tasks for ages 4, 5 and 6 year olds
Development of \textit{TEST2r}

- Refined Screening Protocol (following Pilot study)
- Over 1000 children
- Representative Sample in all areas – DEIS, non-DEIS, urban, rural, etc.
- National Study Database

✓ detailed performance of 1041 children aged 4, 5 and 6 on 27 tasks
Structure of TEST2r

- Factor Analysis of Database (2010) Revealed 7 Factors
  - Visual/Verbal Correspondence
  - Rhyme/Memory
  - Phoneme Segmentation
  - Phoneme Segmentation – Speed
  - Spatial Memory
  - Motor Speed
  - Balance
Structure of TEST2r

- Factor 1 – Visual Verbal
  - Letter Sound Array
  - Letter Knowledge Upper & Lower Case
  - Phonetic Spelling
  - Alliteration
  - Alliteration Oddity
  - Non-Word Completion at Phoneme Level
  - Initial Phoneme Deletion: Non-Word Remaining
Structure of TEST2r

- Factor 2 – Rhyme/Memory
  - Rhyme Recognition 1 & 2
  - Rhyme Recognition Oddity
  - Timed Rhyme Generation
  - Non-Word Repetition
  - Digit Span
  - Word Segmentation
  - Initial Phoneme Deletion: Real Word Remaining
  - Nursery Rhymes
Structure of *TEST2r*

- Factor 3 – Phoneme Segmentation
  - Final Phoneme Deletion: Real Word Remaining
  - Phoneme Deletion from Final Consonant Cluster
  - Final Phoneme Deletion: Non-Word Remaining
  - Initial Phoneme Deletion from Initial Consonant Cluster
  - Non-Word Reading
Structure of TEST2r

- **Factor 4 – Phoneme Segmentation Speed**
  - Initial Phoneme Deletion from Initial Consonant Cluster – Average Time
  - Final Phoneme Deletion: Non-Word Remaining – Average Time
  - Initial Phoneme Deletion: Non-Word Remaining – Average Time
  - Initial Phoneme Deletion: Real Word Remaining – Average Time
  - Phoneme Deletion from Final Consonant Cluster – Average Time
Structure of TEST2r

- Factor 5 – Spatial Memory
  - Squirrel Memory (Forward & Reverse)
  - Finger Localisation
  - Spatial Memory
  - Copying
Structure of \textit{TEST2r}

- **Factor 6 – Motor Speed**
  - 6 Prong Task
  - Dowel Placing Task
  - RAN Objects
  - RAN Digits

- **Factor 7 – Balance**
  - One Foot Balance : Single Task
  - One Foot Balance : Dual Task
Development of TEST2r

Criterion Study (2008 – 2010) – Phase 2

- 841 of original children were psycho-educationally assessed at age 10. (DES supported)
- It was found that many of the tasks administered at age 4, 5 & 6 were predictive of literacy performance at 10 years of age
Phase 2 Validation Study: 5 & 6 year olds

- Multivariate multiple regression analysis: Database 1 and Database 2
- Factor scores – predictors
- Tests of literacy performance = dependent variables
- Multiple regression = more than 1 predictor (7 factors)
- Multivariate element = more than 1 dependent variable (4 literacy scores)
Significant effects identified for TEST 2 on the measures of literacy attainment at 10 years (by age assessed)

<table>
<thead>
<tr>
<th>All DVs</th>
<th>Reading</th>
<th>Spelling</th>
<th>Comprehension (WRAT 4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age when tested</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td><strong>All Factors</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>1. Visual-Verbal Correspondence Factor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter Knowledge: Upper case letter: Total</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter Knowledge: Lower case letter: Total</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Letter Sound Array: Total number fully correct</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Letter Sound Array: Total no. fully and partially correct</td>
<td></td>
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</tr>
<tr>
<td><strong>Letter Sound Array: total no. fully and partially correct</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Letter Sound Array: Total number incorrect</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Word Completion, Phoneme level: Total Score</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alliteration: Total Score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alliteration Oddity: Total Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Initial Phoneme Deletion, NWR: No. correct within time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phonetic Spelling: Total Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
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Note: X indicates a significant effect.
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<tr>
<td>4 5 6</td>
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<tr>
<td><strong>2. Rhyme/ Memory Factor</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Articulation Rate: avg. number of errors</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Nursery Rhymes: Total Score</td>
<td></td>
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<td>X</td>
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<tr>
<td><em>Word Segmentation Test 1: Total Score</em></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Rhyme Recognition 1: Total Score</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Timed Rhyme Generation: (Avg. No. Generated Items)</td>
<td></td>
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<td></td>
<td>X</td>
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<tr>
<td><em>Rhyme Recognition 2: Total Score</em></td>
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<tr>
<td>Digit Span: Forward, Total Score</td>
<td></td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Rhyme Recognition Oddity: Total Score</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Non Word Repetition: Total Score</td>
<td></td>
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<td></td>
<td>X</td>
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<td><em>Initial Phoneme Deletion, RWR: No. correct within time</em></td>
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<td>6</td>
<td>X</td>
<td>X</td>
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3. **Phoneme Segmentation Factor**

- Initial Phoneme Deletion, Initial Consonant Cluster: No. correct within time
  - Age tested: 4, 5, 6
  - Significant effects: X
- Non-Word Reading Total
  - Age tested: 5, 6
  - Significant effects: X
- Phoneme Del. Final Consonant, RWR: No. correct within time
  - Age tested: 6
  - Significant effects: X
- Final Phoneme Deletion - NWR: No. correct within time
  - Age tested: 6
  - Significant effects: X
- Final Phoneme Deletion – Final Consonant Cluster: No. correct within time

4. **Phonemic Segmentation Speed Factor**

- Initial Phoneme Deletion, Real Word: Average time
  - Age tested: 6
  - Significant effects: X
- Initial Phoneme Deletion, Non Word: Average time
  - Age tested: 6
  - Significant effects: X
- Initial Phoneme Deletion, Initial Consonant Cluster: Average time
  - Age tested: 5
  - Significant effects: X
- Phoneme Deletion, Final Consonant, Real Word: Average time
  - Age tested: 4, 5
  - Significant effects: X
- Final Phoneme Deletion – Non Word: Average time
  - Age tested: 6
  - Significant effects: X
- Final Phoneme Deletion from Final Consonant Cluster: Average time
  - Age tested: 6
  - Significant effects: X
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<td>5</td>
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<tr>
<td>5. <strong>Spatial Memory Factor</strong></td>
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<tr>
<td>Spatial Memory Test 1: Forward Total Score</td>
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<td></td>
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</tr>
<tr>
<td>Finger Localisation: hand hidden - single finger touched</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Finger Localisation: hand hidden - 2 fingers touched</td>
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<tr>
<td>Copy Test: Total Score</td>
<td></td>
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<tr>
<td>Squirrel Memory: Forward total score for all levels</td>
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<tr>
<td>Squirrel Memory: Reverse total score for all levels</td>
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<td>4</td>
<td>5</td>
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<tr>
<td><strong>6. Motor Speed Factor</strong></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>6 Prong Test 1: time for 12 cube placement</td>
<td></td>
<td></td>
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<tr>
<td>Dowel Placing Test 1: B(b) Speed of Dowel Placement</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Rapid Automised Naming Objects2: Total Score</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid Automised Naming Digits Test 2: Total RAN Digits Score</td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td><strong>7. Balance Factor</strong></td>
<td></td>
<td>X</td>
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<tr>
<td>Balance Test: Total One Foot, Dual Task Score</td>
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</table>
Phase 2 Findings

- The factor structure within TEST 2R provides a good indication that its theoretical base is sound.

- Factor scores, produced on the basis of the factor structure, accounted for a significant amount of variation in reading and spelling attainment.

- Each of the factors had a differential prediction pattern at each age (i.e. 4 years, 5 years or 6 years) and in relation to literacy activity (i.e. reading, spelling or reading comprehension).

- The TEST 2R factors accounted for a significant proportion of the variance in literacy attainment in both DEIS and non-DEIS schools.
Phase 2 Findings

- Although influenced by a learner’s intelligence, performance on the TEST 2R subtests at 5 or 6 years results in a significant increase in the strength of the prediction of literacy performance at age 10 years.

- The pattern of prediction, once the variance accounted for by IQ was removed, indicated that TEST 2R performance predicted reading and spelling rather than comprehension.
In terms of the predictive power across age of TEST 2R assessment and type of literacy attainment measure (not controlling for IQ), certain factors were more consistent than others.

- **Factor 2 Rhyme and Memory** was significantly related to every measure of attainment apart from a multivariate effect for those assessed at age 6 years.

- **Factor 3 Phoneme Segmentation** was significantly correlated at the multivariate and univariate level for those age groups to whom these subtests could be administered, i.e. these tests were not administered to 4 year olds.

- **Factor 6 Motor Speed and Factor 1 Visual-Verbal Correspondence** were strongly associated at all ages with all individual measures of literacy attainment apart from reading comprehension for those assessed at 4 years. This was not reflected in a multivariate effect for all dependent variables for either factor.

**Phase 2 Findings**
Phase 2 Findings

Particularly Strong Predictors

Factor 2 Rhyme/Memory
  ● Rhyme Recognition Oddity

Factor 3 Phoneme Segmentation
  ● Non-Word Reading

Factor 5 Spatial Memory
  ● Copy Test

Factor 6 Motor Speed
  ● RAN Objects
  ● RAN Digits
Development of TEST2r

• Surviving Tasks in TEST2r as published

Screening Tasks (Class teacher)

1. Letter Knowledge: Upper & Lower Case
2. Rhyme Recognition Oddity
3. Phonetic Spelling
4. Copying
5. Rapid Automatised Naming (RAN): Digits
TEST2r

Diagnostic Tasks (Support Teacher)

6. Letter Sound Array
7. Alliteration Oddity
8. Alliteration: Initial Sound Matching
9. Timed Rhyme Generation
10. Digit Span
11. Non-Word Repetition
12. Initial Phoneme Deletion
13. Final Phoneme Deletion: Real Word Remaining
14. Final Phoneme Deletion: Non-Word Remaining
15. Non-Word Remaining
16. Spatial Memory
17. Finger Localisation
18. Rapid Automatised Naming (RAN): Objects
Development of TEST2r:BETA

Validation of Screener and Diagnostic Tasks on a teacher-rated, counter-balanced, stratified sample across gender and age

- Doing well/not doing well
- Male/Female
- Early 5, late 5, early 6, late 6
Development of TEST2r

Validation Findings – BETA version

- All tasks performed well
- Discriminated between children rated as:
  - not doing well
  - doing well
TEST2r

Elements in TEST2r

- Manual
- Visual Stimulus Book
- Child’s Scorebooklet
- Electronically generated report following data entry (in development)
- TEST2r Website with links to intervention material (in development)
TEST2r – Present Work

- Teacher training countrywide in administration of TEST2r: developing national norms (e.g. Limerick, Cork, Athlone, Sligo, Dublin, etc.....)
- Norm gathering during month of October 2015
- Enriching links to resource material for intervention
- Testing and finalising electronic database and reporting system
TEST2r – Present Work

TEST2r available nationally to schools and educational professionals circa December 2015.
Acknowledgments

- DES for funding Phases 2 & 3
- ILSA for funding throughout Phases 1 & 2
- Prof Emeritus Ray Fuller, School of Psychology, Trinity College Dublin
- Dr Michael Gormley, School of Psychology, Trinity College Dublin
- Dr Donal McAnaney
- Dr Therese McPhillips
- Dr Ciaran Dolphin
- The Blackrock Education Centre, Co Dublin
- The Education Centres of - Athlone, Cork, Drumcondra, Enniscorthy, Limerick and Sligo
- INTO and participating primary teachers
- National Learning Network
- National Disability Authority
- Retired Teachers Network
- National Schools and their Principals
- Sessional Psychologists and their Supervisors
- Participating children and their parents
References


Contact

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