Specific Language Impairment

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Specific Language Impairment (SLI)

• Background
• Identification, Definitions and classifications
• Causality, theory->practice?
• Our Research
• Closing Thoughts
Background

• Specific language impairment (SLI) is a developmental disorder involving language delays (vocabulary, grammar, phonology) that are out of line with a child’s other abilities (non-verbal IQ) and have no obvious cause such as another developmental disorder, acquired brain injury or severe environmental deprivation.

• SLI has an estimated prevalence of 6-7% in school children (e.g. 6.44%, Scerri et al., 2011, ALSPAC cohort)
Background

For between 50%-90% of children with SLI identified during the preschool years, the language problems do not resolve during childhood.

Up to 50% go on to have reading problems, and reading levels tend to predict educational outcomes (Hulme & Snowling, 2009).

SLI associated with poorer academic achievement, employment, and mental health (e.g., Clegg, Hollis, Mawhood, & Rutter, 2005; Snowling, Adams, Bishop, & Stothard, 2001; Young et al., 2002), but variability in outcomes
Definition - Language

Several aspects of definition worth commenting on

• Language a complex system involving
  – Grammar, Semantics, Phonology and Pragmatics
  – There are indications that a common language factor across these and other subskills can be identified in young people with SLI (Tomblin & Zhang, 2006)
  – However, it also is possible to identify subgroups of children with SLI according to their language impairments (Conti-Ramsden & Botting, 1999)

• Thus, SLI involves a range of strengths and weaknesses and this has implications for both research and practice

• Typical levels of ‘non-language’ abilities a key aspect of SLI definition – similarities with dyslexia – but this may be more complicated than first appears
SLCN and SLI

• Since the Bercow (2008) review the term Speech Language and Communication Needs (SLCN) has become popular term to describe children with a range of language speech and communication needs.

• Useful to distinguish between – communication, language and speech

• The therapies used to target particular features of SLCN may be effective with children with a range of disabilities (say SLI, autism, etc).
  – Thus, SLCN approach is extremely useful when thinking about how to provide assistance and interventions
Issues with SLCN?

• Issue of the extent to which similar interventions can be applied across different disabilities and syndromes

• For SLI researchers may need to think about a lower levels of granularity – for example the way particular cognitive difficulties links to particular language difficulties
The ‘Causes’ of SLI

Twin studies indicate a genetic component, but appears to be complex process and certainly not a single gene responsible for SLI

Other theories can be broadly divided into linguistic and cognitive (for me neither entirely satisfactory)
Linguistic Theory

Assumption that children are able to acquire language because they have access to innately specified linguistic rules. These simplify what would otherwise be an impossible task.

Often there is the assumption that children match the speech they hear to these innate rules and so can identify the grammar of the language they hear.

From this it is quite a small step to suggesting that SLI involves difficulties processing speech or more obviously difficulties with the innate rule system.
Examples of Linguistic Theories


Other prominent theories
Gopnik & Crago (1990)
van der Lely – grammatical SLI (van der Lely & Stollwerck, 1997)
Cognitive Accounts

Phonological short term memory and vocabulary (Gathercole & Baddeley, 1990) related to non-word repetition test (Graf et al. 2007)

Other Prominent Theories
Surface Hypothesis (Leonard, 1997)
Quadrant model (Bishop & Snowling, 2004)
Procedural-Declarative Model (Ullman & Pierpont, 2005)
Theory & Practice

Theory has not always translated directly into practice – but provides useful perspectives – better identification of grammatical difficulties + the cognitive difficulties with processing information

For most of remainder of this presentation I will present findings from our ESRC project which identifies areas of general difficulties for children with SLI

This content will link to the SLI workshop this afternoon.
Non-language abilities & SLI?

• By definition non-verbal abilities should be in typical range

• Typical non-verbal IQs often identified using problem solving tasks where language abilities are not expected to help solve the task (e.g. matrices)

• However, evidence of difficulties with some non-linguistic tasks, number skills and motor skills (Bishop, 2002; Cowan, Donlan, Newton & Lloyd, 2005; Johnston & Ellis Weismer, 1983)
Other Cognitive Processes: Executive Functioning

Executive functioning (EF) involves high-level goal-directed behaviours – significant across a range of verbal and non-verbal activities.

- *switching* flexibility of thought and action
- *planning* anticipation and forward thinking
- *inhibition* of inappropriate responses
- *working memory* concurrent remembering and processing
- *fluency* generation of new responses

“...processes that control and regulate thought and action”.

(Friedman et al., 2006, p. 172)
Because of disparity in language and non-verbal ability in SLI we investigated performance on verbal and non-verbal (visuospatial) EF tasks.

- Our method was to choose or develop simple measures of EF to assess each sub-area in the verbal and non-verbal domains.
- Pairs of tasks were comparable, as far as possible, in terms of requirements.
- Verbalisation cannot be entirely ruled out for non-verbal tasks, but it was not required (should at least reduce verbal mediation).
Children with SLI - Sample

41 children and young people (10-14 years)

1. Typical ‘non-verbal IQ’ (BAS II Matrices T-score of at least 40)
2. Language difficulties.
   - Scaled scores of seven or below on at least three out of four CELF-4 UK subtests
   - Recalling sentences, formulated sentences, word classes receptive, word classes expressive
3. No other known developmental disorder such as autism or ADHD

Comparison 88 children without language difficulties
Complex statistics to take account of age and non-verbal ability – provide summary
Switching – No Group Differences

Tasks

Verbal – trail-making (D-KEFS) join letters and numbers in alternate sequence (1-A-2-B-3-C), control conditions for speed without switching

Non-Verbal – (CANTAB) switching when sometimes stimuli is irrelevant and sometimes relevant, speed of switching to appropriate stimuli.
Planning: SLI group poorer on N-V Planning

Children had to sort six cards into two groups of three in as many ways as possible

Verbal categories –
Non-verbal perceptual categories –

Perceptual Sorting:
1. Thick Letters/Thin Letters
3. 1 Curve/2 Curves
4. Horizontal/Vertical
5. Concave Edges/Convex Edges
6. Oval/Rectangle

Verbal Sorting
- Drinks/Weather
- Word/Words
- Hot/Cold
Inhibition: SLI group poorer in n-v

- New VIMI (motor) test developed based on Luria’s hand game.

Build up prepotent response first:
  - Show finger = copy finger
  - Show fist = copy fist
  - n = 20 trials

Now alter instruction: Inhibition trials:
  - Show finger = show fist
  - Show fist = show finger
  - n = 20 trials

Verbal task v. similar and involves repeating words spoken by E. and then after 20 trials providing a different word in response to the same spoken word.
Executive loaded working memory: SLI group poorer in both tasks
Concurrent processing and storage of information

Verbal – listening span (WMTB-C; Pickering & Gathercole, 2001), sets of sentences read & judged true/false, then last word has to be remembered

<table>
<thead>
<tr>
<th>List</th>
<th>True/False (T/F)</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trees are covered in LEAVES</td>
<td>T</td>
<td>LEAVES</td>
</tr>
<tr>
<td>People live in a NEST</td>
<td>F</td>
<td>NEST</td>
</tr>
</tbody>
</table>

Non-verbal – odd-one-out (Henry, 2001), analogue using cards, odd object identified and its location later recalled
Fluency; SLI group poorer in Verbal & NV

Fluency (generate new responses)

Tasks

• Verbal – as many words starting with ‘f’, ‘a’ & ‘s’

• Non-verbal – draw as many different shapes from same set of dots
<table>
<thead>
<tr>
<th>EF task</th>
<th>&lt;1 SD</th>
<th>&lt;2 SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluency verbal</td>
<td>76</td>
<td>22</td>
</tr>
<tr>
<td>Inhibition non-verbal</td>
<td>56</td>
<td>22</td>
</tr>
<tr>
<td>ELWM non-verbal</td>
<td>49</td>
<td>17</td>
</tr>
<tr>
<td>Planning non-verbal</td>
<td>39</td>
<td>24</td>
</tr>
<tr>
<td>Fluency non-verbal</td>
<td>39</td>
<td>5</td>
</tr>
<tr>
<td>ELWM verbal</td>
<td>37</td>
<td>24</td>
</tr>
<tr>
<td>Inhibition verbal</td>
<td>20</td>
<td>12</td>
</tr>
<tr>
<td>Switching verbal</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>Planning verbal</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td>Switching non-verbal</td>
<td>15</td>
<td>7</td>
</tr>
</tbody>
</table>
iPads/Tablets & apps

Research into practice – but at different level

Team at OU developed an free app (Our Story: Messer, Kucircova Hogan, & Whitelock) so that children can be involved in creating narratives using their own pictures, speech/sounds and text

Designed to promote engagement with literacy

We believe personalisation will facilitate learning and communication – interested in evaluating in clinical setting

More broadly low cost apps and ease of iPads use could provide an important direction in intervention

Google: Our Story OU
Research and Practice: Evaluation

Review by Law, Garret & Nye (2004) suggested that interventions most likely to be effective with phonology (speech sounds) and vocabulary. Need for evaluation of interventions an important message about research and practice, but often difficult to implement.
The virtuous circle

• Snowling & Hulme (2011) propose a virtuous circle
  Theory->Interventions (RCT) -> Refine Theory->
• Theory needs to be seen in broadest sense – macro and micro level
• Our suggestion is that SLI involves a broader set of impairments beyond language and in the workshop discussion of what can be put into practice
Thank You

Publication details:

- This research was supported by the Economic and Social Research Council, UK, grant number RES-062-23-0535.

- We would like to thank the teachers, Speech and Language Therapists and children/young people who very kindly helped or participated in this project.

- Thanks also to Zara, Clare and Nisha for valuable help behind the scenes.