SPECIFIC LANGUAGE IMPAIRMENT (SLI) – AN INTRODUCTION

Language Acquisition in Special Circumstances
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Chloe. 4 years & 6 months

Expressive speech delay.flv

- What have you noticed in Chloe’s speech?
- Which aspects of her language are impaired?

Linguistic characteristics of SLI

Sentences produced by children with SLI
(Radford 2006)

<table>
<thead>
<tr>
<th>No</th>
<th>Child</th>
<th>Adult counterpart</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A Maybe goes on this one</td>
<td>Maybe it goes on this one</td>
</tr>
<tr>
<td>2</td>
<td>B What say?</td>
<td>What did you/d'you say?</td>
</tr>
<tr>
<td>3</td>
<td>C Can get us some them?</td>
<td>Can you get us some of them?</td>
</tr>
<tr>
<td>4</td>
<td>C Do this come out?</td>
<td>Does this come out?</td>
</tr>
<tr>
<td>5</td>
<td>C Billy wanna has his blocks out</td>
<td>Billy wants to have his blocks out</td>
</tr>
<tr>
<td>6</td>
<td>C The tree must broken off</td>
<td>The tree must have broken off</td>
</tr>
<tr>
<td>7</td>
<td>D Superman have him hands up</td>
<td>Superman has his hands up</td>
</tr>
<tr>
<td>8</td>
<td>D And they're jump in water</td>
<td>And they're jumping in the water</td>
</tr>
<tr>
<td>9</td>
<td>D This is mine daddy's</td>
<td>This is my daddy's</td>
</tr>
<tr>
<td>10</td>
<td>D I will be Chad brother</td>
<td>I will be Chad's brother</td>
</tr>
<tr>
<td>11</td>
<td>D Them is boys</td>
<td>They are boys</td>
</tr>
<tr>
<td>12</td>
<td>D Me don't know how do it</td>
<td>I don't know how to do it</td>
</tr>
<tr>
<td>13</td>
<td>E How you knowed?</td>
<td>How did you know?</td>
</tr>
<tr>
<td>14</td>
<td>F It cames off</td>
<td>It came off</td>
</tr>
<tr>
<td>15</td>
<td>G I didn't sawed you come in</td>
<td>I didn't see you come in</td>
</tr>
<tr>
<td>16</td>
<td>G Think her too growed up</td>
<td>I think she's too grown up</td>
</tr>
<tr>
<td>17</td>
<td>H What is this is?</td>
<td>What is this?</td>
</tr>
<tr>
<td>18</td>
<td>H What next one is?</td>
<td>What's the next one?</td>
</tr>
<tr>
<td>19</td>
<td>J Hope him gonna hit him butt</td>
<td>I hope he's gonna hit his butt</td>
</tr>
<tr>
<td>20</td>
<td>K Me no like him</td>
<td>I don't like him</td>
</tr>
</tbody>
</table>

SLI - Definition

A developmental language disorder characterized by Gleason (2001, p. 504) as involving ‘delayed or deviant language development in a child who exhibits no cognitive, neurological or social impairment’. Children with SLI show impaired language development from birth with no hearing loss (no history of otitis media), no emotional and behavioral problems, no below average non-verbal IQ(≥85), no neurological problems, and no oral or facial defects (Tallal & Stark 1981). That is, they are normal in other aspects of their physical, mental and social development (Radford 2006).

Expressive vs. receptive deficit

- SLI children typically show some (or all) of the following types of impairment:
  - Phonological (e.g. problems with consonant clusters and syllable-final consonants)
  - Lexical (delayed acquisition of words – e.g. first word appears around 23 months in SLI children, but around 11 months in TD children; SLI children also have word finding problems)
  - Semantic (problems in determining the linguistic meaning of words, phrases and sentences, and understanding the meaning of metaphors)
  - Grammatical (e.g. problems with affixes/inflections and articles/particles, complex syntax)
  - Pragmatic (e.g. problems in the use of language in appropriate contexts)
Major Issues

- Linguistic characteristics of SLI
  - Morpho-phonology
  - Phonological memory and the lexicon
  - Syntax
  - Narratives
- Frequency of SLI
- Genetic basis of SLI
- Neurological basis of SLI
- Other Accounts

Frequency

- In 5 year olds, SLI affects about 2 children in every classroom (about 7%) (Tomblin et al., 1997).
- It is more common in boys than girls.

Genetic basis of SLI

- SLI runs in families.
- 50-70% of children with SLI have a family member with SLI.
- The KE family (Lai, Fisher, Hurst, Vargha-Khadem & Monaco, Nature 413, 2001, Fig. 1)

Individuals with SLI showed reduced activation in brain areas -- the temporal and frontal lobes -- that are critical for speech processing and phonological awareness.


What do genetics studies tell us?

KE Family - FOXP2 in region 7q31 on chromosome 7 - found later to be associated with dyspraxia (motor related activities).
SLIC – OMIM 606711 on chromosome 16 and OMIM 606712 on chromosome 19

What do genetics studies tell us?

Mabel Rice from http://www.youtube.com/watch?v=cnlGvcDIIHw


- 2-month-old infants at risk for SLI demonstrate a massively delayed brain responses for the discrimination of two syllables with vowels of different durations (Friedrich et al., 2004).
- A reduced brain response for the discrimination of the stress pattern of a two-syllable word observed by the age of 4–5 months correlated with the children’s impaired language abilities diagnosed at the age of 4 years (Weber et al., 2005).
10- to 12-year-old children diagnosed with SLI still reveal a pattern of brain responses that are different from age-matched typically developing children. The latter show an N400-P600 pattern in response to a semantic violation, whereas the SLI children show no N400 component, but only a P600 (Sabisch et al., 2006).

What about syntax?
- Children with SLI presented a normal ERP pattern for the processing of content words, but not for function words that carry grammatical information (Neville et al., 1993).
- 12- to 14-year-old children diagnosed with G-SLI, do not demonstrate the syntax-related early left anterior negativity (ELAN) component for violations of nonlocal syntactic relations (Van der Lely and Fonteneau, 2006).
- Impaired language development is correlated with abnormalities in the neurophysiological patterns of different aspects of language processing and with abnormalities in the structures of areas known to support language processes in the healthy adult brain.

Other possible accounts
- Impairment in the language mechanism vs. impairment in language processing aptitude (Domain Specific Accounts)?
- Impairment in language processing vs. impairment in processing (Domain General Accounts)?

Domain General Accounts (Not language specific)
- Auditory (temporal processing) deficit hypothesis
- Auditory Perceptual Deficit Model

English - Percentage correct probes and spontaneous speech (Rice & Wexler 1995)

<table>
<thead>
<tr>
<th></th>
<th>SLI</th>
<th>N3</th>
<th>N5</th>
</tr>
</thead>
<tbody>
<tr>
<td>-ed probe</td>
<td>27</td>
<td>45</td>
<td>92</td>
</tr>
<tr>
<td>-ed spontaneous</td>
<td>23</td>
<td>46</td>
<td>90</td>
</tr>
<tr>
<td>-s probe</td>
<td>23</td>
<td>44</td>
<td>91</td>
</tr>
<tr>
<td>-s spontaneous</td>
<td>37</td>
<td>60</td>
<td>89</td>
</tr>
<tr>
<td>BE probe</td>
<td>50</td>
<td>64</td>
<td>95</td>
</tr>
<tr>
<td>BE spontaneous</td>
<td>46</td>
<td>71</td>
<td>96</td>
</tr>
<tr>
<td>DO probe</td>
<td>30</td>
<td>47</td>
<td>90</td>
</tr>
<tr>
<td>plural</td>
<td>88</td>
<td>96</td>
<td>97</td>
</tr>
<tr>
<td>Prepositions</td>
<td>96</td>
<td>97</td>
<td>98</td>
</tr>
</tbody>
</table>

Hebrew - Percentage correct probes (Dromi et al., 1993, 1999)

Verb inflection in Hebrew (Dromi 1999 et al) - present tense agreement items
Verb inflections in Hebrew - Past tense inflections

Enactment task (Shem et al., 1999)

Procedural Deficit Hypothesis (PDH)

“SLI can be largely explained by the abnormal development of brain structures that constitute the procedural memory system.”

- Procedural memory: “mental grammar”, syntax, some morphology
- Declarative memory: “mental lexicon”, vocabulary, idioms, irregular past-tense forms

PROCEDURAL MEMORY SYSTEM: DEFINITION
- Brain system involved in “procedural memory”
- Learning new and controlling established motor and cognitive skills, habits, and other procedures
  - E.g. typing, riding a bike, skilled game playing
  - Aspects of rule-learning
  - Learning and performing skills involving sequences
- Includes system involved in learning, representation, and use of procedural memory

PROCEDURAL SYSTEM: CHARACTERISTICS
- Gradual acquisition of procedures
- Learning occurs with practice, over time
- Rapid, automatic application
- “Implicit Memory System”

Domain (Language (Grammar)) Specific Accounts
  Due to a genetic deficit SLI children do not have grammatical (syntactic-semantic) features in their grammar. This is a global deficit.
  Studying three generations of a family in London, Gopnik & Cargo concluded that they could not generate morphological rules (due to genetic failure of the dual mechanism of morphological acquisition).

Bishop (1994) - A study of 12 SLI children ranging in age from 8.2 to 12.11
- Took it off (in reply to ‘What did they do with the top part of the pram?’)
- It take me a long time (in reply to ‘Did it take you a long time to get better?’)
- And then Mummy taked to the garage to xxx
- He falled in (in reply to ‘What did Andrew do when the ice gave way?’)
- He sawed mine brother (in reply to ‘Has the doctor ever been to see you?’)
- The car has broked down
Agreement Deficit Model


SLI children have problems with acquiring uninterpretable features, which make no contribution to the meaning of the sentence (semantically redundant), e.g., agreement features.

>> Tsimpli and Stavrakaki (1999) and Tsimpli (2001) - *Uninterpretable Feature Deficit Model*

Extended Optional Infinitives

**Agreement-and-Tense-Omission Model.**

TD children omit either TNS or AGR or neither up to the age of 3. In SLI children this is extended until the age of 7-8. (Wexler K, Schütze C & Rice M, 1998)

**Unique Checking Constraint**

TD children check all the relevant functional categories in a phase. Children with SLI check a single functional category (Wexler 2003)

Is SLI only about tense and agreement?

- In children with SLI (14 Subjects: 3;11-4;10), pragmatic principles develop normally as a function of age, rather than as a function of grammar developmental stage.
- Grammatically, 4-year old children with SLI make errors comparable to younger normally developing children.

<table>
<thead>
<tr>
<th></th>
<th>SLI</th>
<th>N-MLU</th>
<th>N-AGE</th>
<th>N-3-year olds (Schaeffer, 1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>article drop in structures/ phrases</td>
<td>(14/120) 11.5%</td>
<td>(14/106) 13%</td>
<td>(7/45) 14%</td>
<td>(7/82) 9%</td>
</tr>
</tbody>
</table>

Scheaffer at al 2003

- At 5 years of age, children in the SLI group were below age peers in their comprehension of reversible full verbal passives, and similar to their younger lexically-equivalent peers.

Mabel L. Rice, Kenneth Wexler, & Jennifer Francois (2001)

Passive Comprehension: Identification of Agent

Van der Lely HKJ and Battell J (2003)

(a) Who Miss Scarlett saw somebody? (Response to 'Miss Scarlett saw someone in the lounge. Ask me who' — the target response being *Who did Miss Scarlett see in the lounge?*).

(b) Which Reverend Green open a door? (Response to 'Reverend Green opened a door. Ask me which one' — the target response being *Which door did Rev. Green open?*).

(c) What did Colonel Mustard had something in his pocket? (Response to 'Something was in Colonel Mustard’s pocket. Ask me what' — the target response being *What was in Colonel Mustard's pocket?*).
Sample narrative (MoSLI)

Mom prepared food for her children and pro ate pl and pro ate pl.
Then, came a fly.
Then, he was angry.
Then, pro put pl a pretzel on her tail.
Then, pro put pl something hot in her hair.
Then, pro cleaned pl her and that’s it.

Grammatical dependencies

Representational Deficit For Dependent Relations (RDDR)

"SLI children have problems in handling non-local dependencies (between pairs of constituents which are not immediately adjacent)."

Deficit in Computational Grammatical Complexity (CGC)

"The core deficit in some but not all forms of SLI is in the representation and/or mechanisms underlying the construction of hierarchical grammatical structures."

Is it only about the functional system?

Deficits were found for:
- Phonological memory (NWR) & Lexical access
- Syntactic dependencies (SR)
- Narratives
- Executive functions

Is it one impairment?


- At age 10-12:

Children with LeSLI (p. 211)

- “A significant difficulty in the naming task, and on at least one additional lexical task. Their performance on naming was 85% correct (84%-89%), significantly poorer than the average of control participants in 4th-6th grade (M = 95%, SD = 2%, p < .05, Crawford & Howell, 1998 t-test).”
- “Their naming difficulty was manifested in failure to name, in naming errors, and in response times longer than 5 seconds, hesitations, circumlocutions, providing a description instead of naming, and use of gestures.”
- “The lexical difficulty was evident also in their spontaneous speech.”