Predicting persistent speech disorder in the early years: Findings from a population study

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RCSLT Conference September 2017, Glasgow
Acknowledgements

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National Institute for Health Research

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• Collaborators

– Professor Sue Roulstone, University of the West of England
– Laura Miller, University of Bristol
– Professor Tim Peters, University of Bristol
– Professor Alan Emond, University of Bristol
– Dr Paul White, University of the West of England
Background

• Natural variation in development of speech

• Full range of vowels and consonants – age 8 (Smit, 1993; Dodd et al, 2003; James et al, 2001)

• Analysis of referrals to SLP in UK (Broomfield and Dodd, 2004)
  – 6.6% with SSD aged 7-11

• Persistent Speech Disorder (PSD) (Pascoe, Stackhouse and Wells, 2006; Shriberg et al, 2010)
Background- impact of PSD

- Low intelligibility
- Literacy difficulties
- Poor academic outcomes
- Psycho-social development
- Mental health problems

Introduction to ALSPAC

- Avon Longitudinal Study of Parents and Children
- Prospective population study - 14,676 children
- Mothers recruited when pregnant in 1990/1991

www.bristol.ac.uk/alspac
Introduction to ALSPAC

• Data collection methods
  – Questionnaire (parents, children)
  – Direct assessment
    • Subgroup – under age 7
    • All children invited – from age 7
• Connected speech samples taken at age 8 from 7390 children during WOLD
Case Identification

- Children with questionable speech identified
  - Problems with dentalized sibilants or /r/ to [w] = group 1
  - All other problems = group 2

- Group 2 samples – narrow transcription using PROPH on Computerized Profiling (CP) (Long et al, 07)
- Process repeated - control group 50 children
Case identification

Recruited to ALSPAC: 14676

Attended 8 year speech assessment: 7390

Problems with speech: 991

Group 1:
- dentalized sibilants
  - /r/ - [w]: 580

Group 2:
- All others: 411

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Identifying PSD

• Measures based on Percent Consonants Correct –
  – PCC-A – scores all omissions, substitutions and uncommon clinical distortions as errors
  – PCC late eight

• Both measures below -1.2 standard deviations
  – Consistent with Records and Tomblin (1994)
Flow chart for case identification

Recruited to ALSPAC: 14676

Attended 8 year speech assessment: 7390

Problems with speech: 991

Group 1: dentalized sibilants /r/ - [w]: 580

Group 2: All others: 411

Persistent speech difficulties: 263

Didn’t reach case status: 141

Rest of cohort at 8: 6399

Random sample transcribed: 50
Prevalence

- 263 cases (175 boys, 88 girls)
- Prevalence – 3.6%
- Ratio boys to girls – 1.81:1

- Law et al (2000) review – rates for SSD 2.3% to 24.6%
- Shriberg et al (1999) – 3.8%
Risk factors

- Concurrent – School age predictors
- Early – From pre-birth to school entry
Concurrent Characteristics
(school age predictors)

• Demographics
  – Gender, SES, maternal age
• Speech and language performance (concurrent)
  – Comprehension, DDK, phoneme deletion, nonword rep
• Literacy and learning (concurrent)
  – Standardised tests, SATS
• Other developmental (concurrent)
  – Nonverbal IQ, attention, memory, coordination, hearing/grommets, friendships

Analysis – univariable and multivariable logistic regression
Summary of concurrent characteristics

**Demographics:**

- Gender
  - $p=0.003$
- Home ownership
  - $p=0.028$

**Speech and Language:**

- Difficulty pronouncing certain sounds
  - $p=<0.001$
- Non-word repetition
  - $p=<0.001$
Summary of concurrent characteristics

Literacy and learning

Other developmental:

- Coordination problem suspected
  \( p=0.011 \)
- Grommet insertion
  \( p=0.005 \)
- Hearing impairment
  \( p=0.017 \)
## Summary of concurrent characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (boys)</td>
<td>1.69</td>
</tr>
<tr>
<td>Home ownership (non-owners)</td>
<td>1.64</td>
</tr>
<tr>
<td>Difficulty pronouncing certain sounds (yes)</td>
<td>5.59</td>
</tr>
<tr>
<td>Non-word repetition</td>
<td>0.82</td>
</tr>
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<td>2.05</td>
</tr>
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<td>2.18</td>
</tr>
<tr>
<td>Hearing impairment (yes)</td>
<td>1.94</td>
</tr>
</tbody>
</table>
Predictors (early childhood)

- Demographics
  - Gender, SES, maternal age
- Environment
  - Birth order, EAL, reading to child, overcrowding, pregnancy, family history
- Speech and language performance (early)
  - CDI, intelligibility, combining words, grammar
- Literacy and learning (early)
  - School entry assessment
- Other developmental (early)
  - Motor, laterality, feeding

- Analysis – uni-variable and multivariable logistic regression
Summary of early predictors

Demographics:

Home ownership

\[ p = 0.036 \]

Environment:
Summary of early predictors

Speech and Language:

Intelligibility to others at 38m
$p < 0.001$

Combines words at 24m
$p = 0.006$

Word morphology at 38m
$p = 0.001$
Summary of early predictors

**Literacy and learning:**

**Other developmental:**

Weak sucking at 4w

\[ p=0.05 \]
## Summary – Early Predictors

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<th>Predictor</th>
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<tr>
<td>Home ownership (non-owner)</td>
<td>1.52</td>
</tr>
<tr>
<td>Intelligibility to others at 38m (mostly not)</td>
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</tr>
<tr>
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<td>1.81</td>
</tr>
<tr>
<td>Word morphology at 38m (continuous variable)</td>
<td>0.91</td>
</tr>
<tr>
<td>Weak sucking at 4w (continuous variable)</td>
<td>1.45</td>
</tr>
</tbody>
</table>
Summary of important variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio</th>
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<tr>
<td>Gender (boys)</td>
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Clinical Implications

Children identified with SSD at age 2 or 3

- Who is at risk of PSD?
  - Low SES (50% increased risk)
  - Unintelligible to strangers at age 3 (140% increased risk)
  - Not combining words at age 2 (80% increased risk)
  - History of weak sucking at 4 wks (40% increased risk)
  - Poor with word morphology at age 3 – increased risk
Clinical Implications

• When they are older...
  – More likely to be reported as having had coordination problems (100% increased risk)
  – More likely to have had grommets or hearing impairment (100% increased risk)
  – More likely to struggle with nonword repetition

What does this tell us about the nature of PSD?
PSD more likely to have features of both motor and cognitive (phonological) impairment  
(Wren, Roulstone, Miller, 2012)
Prevalence and Predictors of Persistent Speech Sound Disorder at Eight Years Old: Findings From a Population Cohort Study

Yvonne Wren, Laura L. Miller, Tim J. Peters, Alan Emond, and Sue Roulstone

Purpose: The purpose of this study was to determine prevalence and predictors of persistent speech sound disorder (SSD) in children aged 8 years after disregarding children presenting solely with common clinical distortions (i.e., residual errors).

Method: Data from the Avon Longitudinal Study of Parents and Children (Boyd et al., 2012) were used. Children were classified as having persistent SSD on the basis of percentage of consonants correct measures from connected speech samples. Multivariable logistic regression analyses were performed to identify predictors.

Results: The estimated prevalence of persistent SSD was 3.6%. Children with persistent SSD were more likely to be boys and from families who were not homeowners. Early childhood predictors identified as important were weak sucking at 4 weeks, not often combining words at 24 months, limited use of word morphology at 38 months, and being unintelligible to strangers at age 38 months. School-age predictors identified as important were maternal report of difficulty pronouncing certain sounds and hearing impairment at age 7 years, tympanostomy tube insertion at any age up to 8 years, and a history of suspected coordination problems. The contribution of these findings to our understanding of risk factors for persistent SSD and the nature of the condition is considered.

Conclusion: Variables identified as predictive of persistent SSD suggest that factors across motor, cognitive, and linguistic processes may place a child at risk.
ORIGINAL ARTICLE

Distinguishing groups of children with persistent speech disorder: Findings from a prospective population study

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Abstract
As part of a large-scale study of children’s development, 7390 children were assessed on a range of speech tasks. These were used to identify three groups of children with speech errors within the sample: persistent speech disorder (PSD); speech errors but below the threshold for classification as persistent speech disorder (non-PSD); and common clinical distortions only (CCD). These three groups were compared on demographic factors, performance on IQ, non-word repetition, and diadochokinetic tests. Findings showed that the PSD group and the non-PSD group were most similar for gender, socio-economic status, IQ, and non-word repetition. In the diadochokinetic tasks, the PSD group and the CCD groups were more similar. Implications for these findings in terms of clinical practice are discussed.

Key words: ALSPAC, children, disorder, persistent, population, speech
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