Acoustical and perceptual analyses of vowels in suspected developmental apraxia of speech
- a pilot study -

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Introduction

• developmental apraxia of speech (DAS) is a disorder in the ability
to perform purposeful speech movements
  (Hall, Jordan and Robin, 1993)
• DAS is a strongly controversy discussed disorder
• in Germany DAS has not received much attention yet
• children with DAS are claimed to make errors on vowel sounds

Aim

• do German children with suspected DAS actually show vowel and/or
diphthong errors?
• can these errors be detected by perceptual analysis?
• can these errors also be detected by acoustical analysis?
• are there typical features of vowel and/or diphthong production?

Material and methods

• population: 1 child with suspected DAS (m, aged 5;2 years)
  7 normally developing children (m, aged 4;10 to 5;2)
• material: a corpus of isolated word production
  evoked by picture naming

• two experiments were conducted:
  1. perceptual analysis: word productions from the DAS child
     and the 7 controls were presented to 14 raters, who had to
     decide whether the realizations were correct or not
  2. acoustical analysis: the time course of the first two formants F1
     and F2 have been extracted for each of the vowel errors
     identified by perceptual analysis. Six parameters were
     determined: horizontal position, slope, parabolic curvature for
     F1 and F2

Results for acoustical analysis

• the DAS child showed significant deviation in acoustical parameters
  in 13 of 21 items
• deviations are more likely to appear for diphthongs rather than for
  vowels
• for some items of the controls, a high variability of formant trajectories can be observed

Examples:

<table>
<thead>
<tr>
<th>Items</th>
<th>n</th>
<th>&quot;vowel error&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>vowel, long</td>
<td>34</td>
<td>6</td>
</tr>
<tr>
<td>vowel, short</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td>diphthong</td>
<td>40</td>
<td>12</td>
</tr>
<tr>
<td>triphthong</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>sum</td>
<td>100</td>
<td>21</td>
</tr>
</tbody>
</table>

Discussion

• vowel/diphthong errors of one DAS child have been analysed
  with two different approaches – quantitative perceptual
  analysis and objective acoustical analysis
• further studies must be shaped to compare vowel/diphthong
  production of children with DAS and children with SD
• this study indicates that features of vowel production may be
  used as additional clinical markers for diagnosis of DAS

Results for perceptual analysis

• descriptive analysis shows differences in judgement the vowels/ diphthongs between the 14 rater
• when at least seven rater found a production incorrect it was
  labeled with "vowel error"
• 21 items were clearly identified as "vowel/diphthong error" in case of
  the DAS child
• the controls were rated to be free of vowel or diphthong errors

References

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