

Acoustical and perceptive 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 child 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?

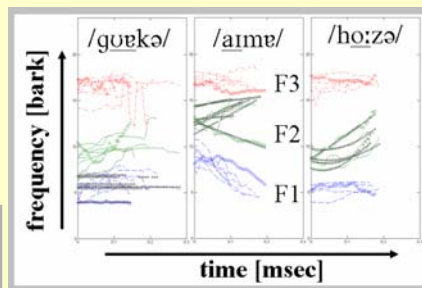
Material and methods

- 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

items, including:	n
vowel, long	34
vowel, short	23
diphthong	40
triphthong	3
sum	100

- two experiments were conducted:

- perceptual analysis:** word productions from the DAS child and the 7 controls were presented to 14 raters, who had to decide whether the realisations were correct or not
- 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



oooo DAS
----- controls
++++ fit

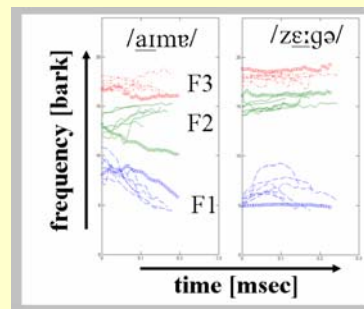
Results for perceptual analysis

- 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

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:



items including:	n	DAS "vowel error"	
		perc.	acoust.
vowel, long	34	6	3
vowel, short	23	1	0
diphthong	40	12	8
triphthong	3	2	2
sum	100	21	13

oooo DAS
----- controls

/eɪmɛ/ Parameter	DAS score	control mean	SD	comp. indiv. score-controls* t (df = 6)	p (two-tailed)
p-F1	7.90	7.43	.84	-.524	.619
s-F1	-12.83	-30.26	8.53	-1.911	.105
c-F1	-144.47	-116.45	277.68	.094	.928
p-F2	11.26	13.77	.76	3.105	.021
s-F2	-14.46	11.13	7.75	3.088	.021
c-F2	62.75	-83.87	57.46	-2.387	.054

* test by Crawford & Howell (1998), in JAVA software singlms

/sæɡɛ/ Parameter	DAS score	control mean	SD	comp. indiv. score-controls* t (df = 6)	p (two-tailed)
p-F1	5.05	6.55	.90	1.557	.170
s-F1	-.27	1.95	6.98	.297	.776
c-F1	-14.41	-250.16	.39	-1.796	.123
p-F2	16.25	15.12	.39	-2.693	.036
s-F2	.62	4.50	5.23	.695	.513
c-F2	15.28	55.93	119.32	-.319	.761

* test by Crawford & Howell (1998), in JAVA software are singlms

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

References

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