Speech Development in Monozygotic and Dizygotic Twins With Speech Delay

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INTRODUCTION

- Early studies of twin children suggest varying degrees of delay in twin children's speech development compared to single birth children.
- Differences in speech development between typically developing twins and singletons have been established, but no research to date has examined possible differences in the development of speech sound production in twin and singleton children with diagnosed speech sound delays.
- Understanding any such differences in speech sound development may help to highlight factors that predict long-term normalization and identify speech-sound attributes that are unique to speech-delayed twins.

Research Questions:

- 1. Do preschool twins with a history of speech sound delay differ from singleton speech-delayed preschoolers in speech sound production skills?
- 2. Do adolescent twins with a history of speech sound delay differ from adolescent singleton children with a history of speech-sound delay in speech sound production skills?
- 3. Do speech-delayed monozygotic twins differ from speech-delayed dizygotic twins in speech sound production skills?
- 4. Do speech-delayed monozygotic twins differ from speech-delayed dizygotic twins in rate of speech sound improvement?

METHOD

Participants:

- Five sets of twin children (1 male dizygotic, 1 female monozygotic, 1 female dizygotic, and 2 female dizygotic) were assessed.
- The twin children's ages ranged from 35 to 60 months during the initial evaluation ($\underline{M}$ = 50) and from 110 to 181 months at follow-up testing ($\underline{M}$ = 150).
- Conversational speech samples comprised of a minimum of 100 naturally occurring utterances were collected and transcribed using narrow phonetic transcription methods (Shriberg & Kent, 1995).

METHOD (cont.)

- Speech analyses were conducted on the first 90 unique words using PEPPER software (Shriberg, 1986), which yielded the following articulation competence measurements (Shriberg, Austin, Lewis, McSweeny, & Wilson, 1997):
  - Percentage of Consonants Correct – Revised (PCC-R),
  - Percentage of Consonants in the Inventory - Revised (PCI -R),
  - Percentage of Consonants/ Diphthongs Correct- Revised (PVC-R),
  - Percentage of Phonemes Correct- Revised (PPC-R), and
  - Intelligibility Index (II).
- All initial and follow-up PEPPER measures were converted to z scores to neutralize age and sex differences.
  - Comparisons for z-scores were made against age matched singleton children with speech delay from a reference data set which provides age and sex specific means and standard deviations (Austin & Shriberg, 1997).
- The Intervention Efficiency Index (IEI) was used to determine rate of change from initial to follow-up testing. IEI was calculated by dividing the developmental gain (initial scores - follow-up scores) by the amount of time between testing.
  - An index score of 1.0 indicates that gains match chronological age growth between initial and follow-up testing.

RESULTS

Twins versus Singletons

- Multivariate analysis of variance of all PEPPER z-scores revealed no significant difference overall between twins and singletons with speech delay (see Table 1.).

Table 1. Z-Scores For Initial and Follow-Up PEPPER Measures For All Twins

		PCC-R		PVC-R		PPC-R		PCI		II	
Twin	Type*	Initial	Follow-up	Initial	Follow-up	Initial	Follow-up	Initial	Follow-up	Initial	Follow-up
1a	D	-0.11	0.37	0.53	0.23	0.02	0.35	0.45	0.37	-0.41	0.21
1b	D	-1.39	-1.30	1.04	0.45	-0.83	-0.64	-1.92	0.37	0.31	0.16
2a	D	1.03	0.89	0.59	0.50	1.01	1.02	0.45	0.00	0.84	0.40
2b	D	1.39	1.20	0.42	0.50	1.28	1.33	-0.39	0.00	0.41	-7.68
Mean	D	0.23	0.29	**0.65**	**0.42**	0.37	0.52	0.23	0.29	0.29	-1.73
3a	M	-0.82	-2.68	-0.94	-3.05	-0.96	-3.07	-0.26	0.00	-0.78	-6.02
3b	M	0.85	-0.59	-0.8	-1.50	0.54	-0.75	0.60	0.00	-0.31	-0.56
4a	M	0.04	0.92	-0.89	-1.55	-0.18	0.78	-0.78	0.00	0.85	0.40
4b	M	1.06	0.68	-0.27	-1.50	0.84	0.55	-0.68	0.00	1.02	-2.42
5a	M	-0.88	-1.68	-1.38	-3.12	-1.05	-2.49	-2.98	0.37	-1.45	0.00
5b	M	-2.31	-1.08	-0.90	-1.28	-2.18	-1.25	-2.49	0.37	-0.94	0.59
Mean	M	-0.34	-0.74	**-0.86**	**-2.00**	-0.50	-1.04	-0.34	-0.74	-0.27	-1.34

Note. Shaded areas indicate dizygotic twin scores. Boldened values indicate significant difference ($p<0.01$).
*D= Dizygotic, M= Monozygotic.

RESULTS (cont.)

Monozygotic versus Dizygotic

- Each of the dizygotic twins performed within +/- 1.5 SD of the reference group means for all but 2 measures.
- Monozygotic twins earned 13 of the 15 PEPPER z-scores that fell greater than –1.5 SD from the reference group means.
- Chi square analysis revealed a significant difference in the distribution between the two groups (x^2= 5.23, p = .02).
- Monozygotic twins scores were also significantly lower than dizygotic twins on PVC-R at both initial and follow-up testing.

Rate of Change

- Monozygotic twins scored significantly higher than dizygotic twins on the IEI for the PVC-R measure (p=.007, see Figure 1.). No other significant differences were found.

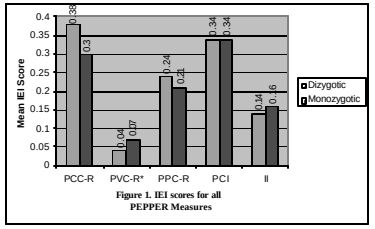

Figure 1. IEI scores for all PEPPER Measures

DISCUSSION

- While 15% of the speech-delayed twins' PEPPER z-scores fell greater than -1.5 SD compared to speech-delayed singletons, no significant difference between the groups was found. This suggests that speech-delayed twins and singletons may be more similar than twins and singletons without speech delays.
- The majority of z-scores that fell greater than -1.5 SD were found at follow-up testing. This may represent ceiling effects as many of the reference group speech-delayed singletons had achieved mastery on these measures at follow-up testing.

DISCUSSION (cont.)

- The significant difference in the distribution of z-scores that fell -1.5 SD suggests that dizygotic twins are more similar to speech-delayed singletons in speech sound production than monozygotic twins.
- Only one PEPPER measure (PVC-R) was found to be significantly different between mono- and dizygotic twins, suggesting more similarities than differences between these groups in specific error types.
- The differences observed between mono- and dizygotic twins on rate of change (IEI) for PVC-R may have been the result of one set of monozygotic twins being noticeably younger (2;11 vs. 4;0-5;0) than the rest of the twins pairs at initial testing. Rate of change might be expected to be faster at this younger age.
- Future research should include a larger sample size of twins, controlling for age, sex, and zygosity within groups.

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