

GENDER DIFFERENCES IN THE SPEECH PATTERNS OF TWO AND A HALF YEAR OLD CHILDREN.

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ABSTRACT - The speech patterns of 50 normally developing two and a half year old children were investigated. Differences were found between the males and females for a distinct clustering of processes that simplify syllable structure. There was a significantly greater use of final consonant deletion, weak syllable deletion, and cluster reduction by the boys, while there was no differences in the use of other speech processes or for receptive and expressive language abilities. A discriminant function constructed from these 3 syllable simplifying processes correctly classified each subject as being either male or female with eighty percent success. Interestingly, in the pre-school and early school years boys have a higher incidence of developmental speech disorders than girls (2 to 1), with the marked use of weak syllable deletion, final consonant deletion, and cluster reduction distinguishing severe cases of developmental speech disorder. These are the same process identified in this study as being generally more evident in boys than girls at two and a half years of age. The question arises as to whether there is any relationship between early patterns of speech development in a child and later identification as having a speech disorder.

INTRODUCTION

Gender differences have consistently been reported in the development of verbal abilities in children. On average, girls have better verbal abilities than boys across a wide range of tasks (Deaux, 1985; Hyde & Linn, 1988; Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994). The reported effects, however, are small. Fenson et al. (1994) found that only 1-2% of the variance in their study of language development between 6-30 months could be accounted for by gender. The results obtained by Hyde & Linn (1988) were consistent with this. Applying meta-analysis techniques to over 170 studies, they found that gender accounted for only approximately 1% of the variance. The one exception, however, was in the area of speech production. The variance in this domain was in the order of 10-15%.

Studies of gender differences in the acquisition of speech abilities are uncommon and are usually associated with projects collecting normative data on the development of speech sounds (Templin, 1963; Winitz, 1969; Smit, Hand, Freilinger, Bernthal, & Bird, 1990). One exception is a study by Kenny & Prather (1986) who investigated gender variability in the speech production of 3-5 year olds. They found that boys were significantly more variable in their production of words than girls, suggesting that the girls have a superior mastery of speech sounds than the boys. In the few normative studies where gender has been considered as a variable in speech acquisition findings indicate a small but often significant gender difference favouring girls. Interpreting these normative studies, however, is problematic. Contemporary analysis of children's speech is based upon the linguistic analysis of a child's overall phonological system (Ingram, 1989). Contrary to this linguistic approach, these normative studies, even as recently as Smit et al. (1990) report findings on individual speech sounds without reference to how they were organised as a linguistic system. These reports provide no information about syllable structure or about linguistic simplification patterns that occur generally across all classes of speech sounds (for example the very common pattern in the speech of young children of all fricatives being simplified to stops, such as "s" or "f" being pronounced as "t" or "p"). Possible differences between boys and girls in the organisation of their speech systems is unavailable. One cannot report on differences in syllable use when syllables are not investigated.

There is one substantial difference between males and females in speech acquisition that has not been satisfactorily explained. Speech disorders occur at twice the rate amongst boys than amongst girls (Peckham, 1973; Healey, Ackerman, Chappell, Perrin & Stromer, 1981; Enderby & Philipp, 1986). In moderate to severe cases, where these children are highly unintelligible, the ratio of boys to girls is even higher (2.5 to 1) (Sheridan, 1973; Hodson & Paden, 1981). The reasons for this pronounced gender bias are currently unknown, though Lewis (1990), in a recent study of the familial histories of speech disordered children, suggested that the weight of evidence points to social and environmental factors interacting with some form of hereditary predisposition that involves a "sex-specific threshold" with boys having a lower threshold than girls.

Shriberg & Kwiatkowski (1994) in reviewing the literature and their own study of 178 school-age children with speech disorders concluded that the origins of such speech disorders are still problematic, resulting in difficulties in developing more effective prevention and intervention strategies. Direct correlations with organic or psycho-social factors are low, making earlier prediction ineffective at the moment.. A potentially fruitful line of investigation would be to determine the extent to which differences in the path of early speech development itself may account for a child's later presentation with a speech disorder. Is there some aspect of the acquisition of speech by males that makes them more vulnerable to speech disorder than females?

THIS STUDY

In this study, the speech production, expressive language, and receptive language abilities of 50 two and a half year old children are reported. The 22 females and 28 males in the study were recruited from local playgroups in the Adelaide metropolitan area. They were matched for socio-economic status of the parents (Daniels, 1983), language background (Australian English), and birth order. There was no difference between the 2 groups for history of middle ear infections as reported by their parents.

Speech and language samples were elicited by the child talking to a researcher within a free-play session using a selected range of toys and pictures. A parent was also present during this sampling period. The speech samples were elicited by spontaneous and prompted naming of 62 key words. These words were preselected on the basis of being reported as common in the early productive vocabularies of children and reflecting a wide range of target phonemes and syllable structures. The samples were phonetically transcribed and differences between the expected adult form and the child's actual realisations were categorised according to the 16 main phonological processes of simplification outlined by Grunwell (1982). The language samples were elicited by a researcher as a separate task involving free-play with a range of toys. Language transcripts were then analysed for mean length of utterance as a robust measure of early expressive language development. Receptive language was measured using the Peabody Picture Vocabulary Test-Revised, and the receptive scale of the Receptive-Expressive Emergent Language Scale (REEL). Table 1 displays the average and standard deviation for birth order and socioeconomic status (ses) for the two groups.

group	number	birth order	ses
female	22	1.4 (0.5)	4.8 (1.2)
male	28	1.6 (0.5)	4.5 (1.1)

Table 1. Birth order and socio-economic status of male and female children

RESULTS

Mann-Whitney U tests were undertaken with the identified speech and language variables. There were no significant differences between the boys and girls for either receptive or expressive language, though the result for expressive language was close to significance ($p = 0.05$). Significant differences were found for a distinct clustering of speech processes related to the simplification of

syllable structure. There was significantly more use by the boys of final consonant deletion, weak syllable deletion, and cluster reduction in their speech. There were no significant differences between the groups for any of the other thirteen categories of speech processes, which related to simplification of speech segments rather than syllable structure. Table 2 displays the average and standard deviation values for receptive language (PPVT score) and expressive language (MLU) as well as the percentage occurrence of the 3 syllable simplifying speech processes.

	receptive	expressive	wsd	fcd	cluster reduct.
female	21.4 (8.7)	3.3 (0.7)	9.5(6.2)	9.1 (5.9)	39.2 (18.1)
male	20.0 (7.5)	2.8 (0.7)	21.8* (8.0)	25.0* (17.4)	58.5* (21.0)

* significant ($< .05$)

Table 2. Receptive and expressive language values, and percentage occurrence of syllable simplification patterns.

In a discriminant analysis involving the three identified syllable simplifying processes, a significant discriminant function was constructed that was able to classify each subject as either belonging to the male or female group with an eighty percent success rate.

DISCUSSION

The gender related speech differences found in this study were quite substantial and accounted for 19% of the variance. The indication of substantial differences in speech development but not language development, are consistent with previous studies of verbal ability in boys and girls. What is new in this study is the finding that the pattern of speech differences between the boys and girls does not reflect a general "across the board" delay in speech development but is related to specific aspects of speech organisation - the production of syllable structure. Such a distinct pattern of difference in speech development has not been identified before and has the potential to clarify at what level of speech processing this difference arises (Shriberg, 1994; Dodd & McCormack, 1995). There are three potential levels where differences could arise: a) the level of speech motor production (phonetic implementation), b) the model of speaking provided to the child by the parents or others, or c) the cognitive-linguistic level (phonological representations, which are essentially mental). If there were differences in motor immaturity between the two groups then one would expect differences in speech production across a range of speech sounds as "errors" arose from incorrect or less accurate movement of the speech articulators (for example, saying "tai" instead of "sat" or "gup" instead of "cup"). This was not so. Differences solely in syllable organisation suggest that the level involved is that of the phonological (pre-motor) representation of how words are spoken. Could this arise from differences in speech input to the children? There is considerable evidence that parents use qualitatively different communication strategies with boys compared to girls (Deaux, 1985). As a preliminary hypothesis, however, there appears to be no principled reason to expect parents to model reduced syllable patterns more to boys than to girls. Further to this, children's speech (and language) is noted for pronunciations of words that they never hear modelled to them, but arise from their own simplification strategies (Ingram, 1976; Shriberg, 1994; Dodd, & McCormack, 1995). This unique clustering of differences in syllable simplification is suggestive of either immaturity in the cognitive-linguistic acquisition of the speech system itself, or of a strategy to reduce syllable structure as an indirect way of dealing with phonetic immaturity. In other words this second possibility suggests that syllable structure is simplified at the pre-articulatory level to make words easier to pronounce in the presence of less well developed articulatory skill. However, this hypothesis needs to be tested with larger subject numbers and involve instrumental analyses of speech motor abilities to compliment the perceptually based phonetic transcription of the children's speech.

As previously mentioned, boys have been reported consistently to have a higher incidence of developmental speech disorders than girls. Interestingly, a number of researchers have indicated that it is the marked presence of weak syllable deletion, final consonant deletion, and cluster reduction that particularly distinguish the severe cases of developmental speech disorders (Shriberg &

Kwiatkowski, 1982; Hoffman, Schuckers, & Daniloff, 1989). These are the same process that have been identified in this study as being less well developed in boys than girls at two and a half years of age.

A gender bias of approximately the same proportion exists in both circumstances. Is there a link between these 2 patterns? Obviously, since the prevalence of speech disorders at school age is between 10 and 15%, it is likely that only about 5 to 6 of the 50 children from the 2.5 year old group will go on to exhibit a speech disorder at preschool age. Twenty four of the 50 children (18 boys, 6 girls) were categorised as users of syllable simplification patterns, though only 7 children (males) used each of the 3 patterns more than 40% of the time. Is there any relation between the marked use of syllable reduction patterns by a child at 2.5 years and the later identification at preschool of a speech disorder? If so, why does one syllable reducing child go on to develop a recognised speech disorder while another child with a similar pattern go on to develop normal speech? If there is no relation between these earlier and later syllable reducing patterns, what are the earlier speech characteristics of the children that go on to develop a diagnosable speech disorder at preschool? The results of this study suggest that a fruitful line of research would be to investigate the extent to which differences in the path of early speech development itself may account for a child's later presentation with a speech disorder. If there is such a link, then earlier detection of children at risk for speech disorders would be possible.

REFERENCES

- Daniels, A. (1983). *Power, privilege and prestige: Occupations in Australia*. Melbourne: Longman Cheshire.
- Deaux, K. (1985). Sex and gender. In M.R. Rosenzweig & L.W. Porter (Eds.) *Annual review of psychology*, (Vol. 36, pp. 49-81). Palo Alto, CA: Annual Reviews.
- Dodd, B. & McCormack, P.F. (1995). A model of speech processing for differential diagnosis of phonological disorders. In B. Dodd (Ed.) *Differential Diagnosis & Treatment of Children with Speech Disorder*, pp. 65-90. London: Whurr.
- Endery, P.M., & Philipp, R. (1986). Speech and language handicap: Towards knowing the size of the problem. *British Journal of Disorders of Communication*, 21, 151-65.
- Feingold, A. (1988). Cognitive gender differences are disappearing. *American Psychologist*, 43, 95-103.
- Felsenfeld, S., Broen, P.A., & McGue, M. (1994). A 28 year follow-up of adults with a history of moderate phonological disorder: Educational and occupational results. *Journal of Speech and Hearing Research*, 37, 1341-1353.
- Fenson, L., Dale, P., Reznick, J.S., Bates, E., Thal, D., & Pethick, S.J. (1994). Variability in Early Communicative Development. *Monographs of the Society for Research in Child Development*, Serial No. 242, Vol. 59 (5).
- Grunwell, P. (1985). *Phonological Assessment of Child Speech*. Windsor: NFERR-Nelson
- Harasty, J. & Reed, V. (1994). The prevalence of speech and language impairment in two schools. *Australian Journal of Human Communication Disorders*, 22 (1), 1-23.
- Hazard Munro, B. & Batten Page, E. (1993). *Statistical Methods for Health Care Research* (2nd ed.). Philadelphia: J.B. Lippincott Co..
- Healey, W.C., Ackerman, B.C., Chappell, C.R., Perrin, K.L., & Stormer, J. (1981). *The prevalence of communicative disorders: A review of the literature*. Rockville Maryland: ASHA publications.
- Hodson, B.W. & Paden, E.P. (1981). Phonological processes which characterize unintelligible and intelligible speech in early childhood. *Journal of Speech and Hearing Disorders*, 46, 369-373.

- Hoffman, P.R., Schuckers, G.H., & Daniloff, R.G. (1989). *Children's Phonetic Disorders: Theory and Treatment*. Boston: College-Hill.
- Hyde, J.S. & Linn, M.C. (1988). Gender differences in verbal abilities: a meta-analysis. *Psychological Bulletin*, 104, 53-69.
- Ingram, D. (1989). *Phonological Disability in Children*. London: Edward Arnold.
- Kenny, K. & Prather, E. (1986). Articulation in preschool children: Consistency of productions. *Journal of Speech and Hearing Research*, 29, 29-36.
- Lewis, B. (1990). Familial disorders: Four pedigrees. *Journal of Speech and Hearing Disorders*, 55, 160-70.
- Lewis, B., Ekelman, B., & Aram, D. (1989). A familial study of severe phonological disorders. *Journal of Speech and Hearing Research*, 32, 713-724.
- Pekham, C.S. (1973). Speech defects in a national sample of children aged seven years. *British Journal of Disorders of Communication*, 8, 2-8.
- Reznick, J.S. & Goldfield, B.A. (1992). Rapid change in lexical development in comprehension and production. *Developmental Psychology*, 28, 406-413.
- Sheridan, M.D. (1973). Children of seven years with marked speech defects. *British Journal of Disorders of Communication*, 8, 9-16.
- Shriberg, L.D. (1994). Five subtypes of developmental phonological disorder. *Clinical Communication Disorders*, 4 (1), 38-53.
- Shriberg, L.D. & Kwiatkowski, J. (1994). Developmental phonological disorders 1. *Journal of Speech and Hearing Research*, 37(5), 1100-26.
- Smit, A.B. & Bernthal, J.E. (1983). Performance of articulation disordered children on language and perception measures. *Journal of Speech and Hearing Research*, 26, 124-36.
- Smit, A.B., Hand, L., Freilinger, J., Bernthal, J., & Bird, A. (1990). The Iowa articulation norm project and its Nebraska replication. *Journal of Speech and Hearing Disorders*, 55, 779-798.
- Templin, M. (1968). *Longitudinal study through the 4th grade of language skills of children with varying speech sound articulation in kindergarten*. (Final Report, Project 2220). Washington D.C.: U.S. Department of Health, Education & Welfare.
- Winitz, H. (1969). *Articulatory Acquisition and Behaviour*. Englewood Cliffs, N.J.: Prentice Hall.

