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Language Disabilities in Three Twin Pairs and Their Relatives

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Abstract. Three pairs of monozygotic twins were ascertained during a general survey of language disabilities conducted among schoolchildren of Porto Alegre, Brazil. Two of them were concordant for dysgraphia, dysorthographia, dyslexia, and speech defects, while the other was concordant for dysorthographia and dyslexia, but discordant for dysgraphia. Two of the mothers and two sibs also presented language problems, but of a type that was not completely similar to those of the twins. Concomitant neurological and psychological studies, as well as the family histories, helped to understand the similarities observed.

Key words: Language disabilities, Neuropsychological evaluations, Dysgraphia, Dysorthographia, Dyslexia, Speech defects

INTRODUCTION

Twin studies concerning language disabilities are not numerous, and they have been generally concerned with dyslexia [7,16,19] or speech defects [5,8,11,12] only; moreover, they did not include the investigation of the twins' relatives. Therefore, when we ascertained three pairs of twins during a general survey on language disabilities conducted among schoolchildren of Porto Alegre, Brazil, we decided to study their parents and sibs, and to report the results in detail. These data are presented herein.

SUBJECTS AND METHODS

The survey was performed in 1,598 schoolchildren from five primary public schools, chosen at random from those attended by children of average socioeconomic level. The screening procedure used was a spelling test, and four of the six twins were ascertained in this way.

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The zygosity diagnosis was made using the ABO, MNSs, Rh (five sera), Duffy, Kell and P blood groups; haptoglobin, transferrin, ceruloplasmin and albumin serum protein types; and the following erythrocyte enzyme systems: phosphoglucomutase (loci 1 and 2), glucose-6-phosphate dehydrogenase, phosphogluconate dehydrogenase, adenylate kinase and adenosine deaminase. The methods used were described or referenced in [15]. The highest probability of dizygosity in the three pairs, all of them concordant for all these genetic markers, was calculated as 2%, following procedures given in [13]. The three pairs, therefore were classified as monozygotic.

For the diagnosis of the language disabilities, specific pedagogical tests were elaborated, with different versions for children and adults [3]. For the first, the application of the writing tests involved three sessions of 50 min each, while the reading and comprehension, as well as speech and articulation tests, were conducted in two other 50 min sessions. The adults were studied in sessions of 120 min duration.

The neurological studies included temporal and spatial organization tests [2,4,17], lateral dominance measures [6] and Lefèvre's neurological development profile [10,14], applied in 60 min sessions. Psychological evaluations involved the WISC as well as Bender (Koppitz-Santucci) tests, adapted for use in Brazil [1,9,18], conducted in four 60 min sessions. Finally, information about the twins' preperi- and postnatal development, as well as that of their sibs, about the presence of language and/or learning disabilities in their families, and about their socioeconomic levels, were obtained from their mothers, in interviews that lasted about one hour.

RESULTS AND DISCUSSION

All the three pairs of twins have parents of high socioeconomic level; the parents of the c pair (Figure) are now divorced, and the twins are being raised by their mother. Their conditions at birth have been described as good, cII-1 having a birthweight of 2,490g and his brother of 2,420g. The same is not true for the other two pairs, who were born prematurely and in bad health conditions. Their birthweights were as follows: aII-1 and aII-2: 1,200 g; bII-2 and bII-3: 1,850g. Twins aII-1 and aII-2 showed retardation in their language development. Both started to speak the first words at age two only, and to make sentences half-a-year later. No other cases of persons with language difficulties were reported in the three families, besides those indicated in the Figure.

Table 1 presents the results of neuropsychological evaluations made in the three pairs and two sibs of the probands. The spatial evaluation in the neurological evolutional examination, as well as the trunk-limbs coordination assessment in Lefèvre's tests, could not be made in all-2 because he had poliomyelitis at the age of one year and two months, having as a sequela one leg shorter than the other. Twins all-1 and all-2 were not evaluated psychologically because at the time the tests were being performed they had moved without leaving their new address.

Of all subjects tested (the three pairs + two sibs) only aII-2 and aII-3 had problems with the neurological evolutional examination. Discordance concerning laterality occurred in twins bII-2 and bII-3 only, one being classified as total right and the other as not established. As for the neurological development profile, discordance was now observed in twins cII-1 and cII-2. No such discordances were found in the psychological tests, both members of one of the pairs being classified as low average in the WISC and Bender evaluations, while in the other classifications were average for the WISC and low average for the Bender determinations.

The data on language are presented in Table 2 and in the Figure. Concordance was now striking between the twins in relation both to types and number of errors, considering writing, reading and speech tests (exceptions are the number of orthographic errors

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Table 1 - Neuropsychological Evaluations of three Pairs of Monozygotic Twins and their Sibs

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in twins alI-1 and alI-2, and clI-1 and clI-2, and one discrepancy for types of reading errors in alI-1 and alI-2.) Considering all tests together, the diagnoses are presented at the bottom of Table 2 and of the Figure. Pairs of families a and b present all four main disabilities (dysgraphia, dysorthographia, dyslexia and speech defects) in a concordant way; while those of family c are concordant for dysorthographia and dyslexia, but discordant for dysgraphia. It should be stressed that all twins have always studied in separate classrooms. As for the twins' relatives, in pedigrees a and b the two mothers, one sister and one brother also showed language disabilities, although in three of the four cases they differed somewhat from those of the twins.

It could be thought that the discordance concerning dysgraphia in twins cII-1 and cII-2 would be related to differences in hemispheric specialization. But the dysgraphic twin presented a more defined hand and eye lateralisation and showed a higher performance IQ than his cotwin; it is however true that he performed poorly than the latter in the gesture imitation test of the neurological evolutional examination.

The results presented here agree in a general way with previous findings concerning dyslexia and speech defects. In relation to the former disability, only 5 of 74 pairs of monozygotic twins (7%) were reported as discordant [7,16,19]; while for speech development, word articulation and stuttering, this value would be about 10% in nearly 200 monozygotic pairs [5,8,11,12]. Much higher frequencies were found among dizygotic pairs. The influence of genetic factors in the etiology of language disabilities is now clearly established, although details of the gene-environmental interaction in the different categories of such defects are far from being elucidated.



Figure. Language disabilities observed in three pairs of twins and their close relatives.

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