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Behavioural Genetics of Early Childhood: Fears, Restlessness, Motion Sickness and Enuresis

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Abstract. Seventy-nine pairs of same-sex twins were examined at the age of three years at a municipal clinic and their mothers were interviewed to assess the twins' current and past behaviours. The zygosity was determined after the interview by fingerprints and/or bloodtyping in the majority of cases. The following significant differences in concordance between monozygotic and dizygotic twins were found: 1) fear of strangers during observation at the clinic; 2) marked fear of strangers in the first year of life; 3) whether or not the child was startled by sudden noises during infancy; 4) whether or not the child was able to sleep alone at three years without a parent sitting nearby; 5) susceptibility to motion sickness; 6) nocturnal enuresis; 7) short attention span or restlessness during the test.

Key words: Behavioral genetics, Early childhood, Fears, Motion sickness, Restlessness, Enuresis

INTRODUCTION

Behaviors in early childhood have been investigated mainly in relation to mother-child interaction and other intrafamilial environmental factors. However, twin studies indicated that genetic factors play an important role in some behaviors, among others: fear of strangers [6,7,9,13], restlessness [6], temperamental characteristics including approach versus withdrawal (the child's initial reaction to any new stimuli) and threshold of responsiveness [15,16], susceptibility to motion sickness [5], and enuresis [3]. Our previous studies showed a tendency of parent-child transmission of motion sickness [1], enuresis, restlessness and stranger anxiety at 3 years [2]. In the present paper we report results of our twin study aimed at reexamining aforementioned findings as well as to find other characteristics in which genetic factors play an important role.

SUBJECTS AND METHOD

The subjects are twins who visited the municipal well-child clinic, Abeno Area Health Centre, Children's Clinic of Osaka City after 1969 for physical and psychological check-up for 3-year-olds. Through a welfare program started in 1959, all the children born in Abeno area (population about 141,000) are invited to come to the clinic within 10 days of their third birthday. On the day of the check-up, while developmental tests are being administered to the child, the mother fills in a questionnaire on the child's past and current behaviors – among others, whether or not her child had, at the time of the check-up, the characteristics corresponding to Items 1-11 of the Table.

Since 1969, the following two questions have been asked to the mother of all same-sex twins visiting the clinic: 1) whether or not anybody living in the same household or any familiar relative often mistook one twin for the other (we included this question as we found Nichols-Bilbro's results [10] useful) and 2) what, if anything, did the obstetrician say about the zygosity of the twins. Further the twins were assessed by one of us with regard to similarities of eyes, nose, ears and hair texture, and fingerprints were obtained from both twins if the mother gave consent and the twins were cooperative.

Between 1969-1981, 79 pairs of same-sex twins, 37 male and 42 female, were thus examined and fingerprints were obtained from 63 of them. The obstetrician's opinion was taken into consideration, though later bloodtyping showed it was wrong at least in two cases.

The fingerprints were analysed by Slater's method [14]. When there was disagreement in the various assessments or when fingerprints could not be obtained, the twins were invited to undergo bloodtyping and 25 pairs were tested (by Professor H. Matsumoto and his colleagues at the Department of Forensic Medicine, Osaka Medical College) with regard to the following systems of genetic markers: ABO, MNSs, P, Se, Rh-Hr, Kell, Kidd, Duffy, Lewis, Lutheran, Diego, Haptoglobin, Transferrin, serum globulin (Gc), immunoglobulin (Gm), serum alpha₁-trypsin inhibitor (Pi), phosphoglucomutase, adenosine deaminase, phosphogluconate dehydrogenase, esterase D, glutamateoxalate transaminase, glutamatepyruvate transaminase, phosphohexose isomerase, uridine monophosphate kinase, glucose-6-phosphate dehydrogenase. There remained 14 pairs of twins, for whom neither fingerprints nor bloodtyping was available. In 9 of these, the afore-mentioned criteria all pointed to the same zygosity and this was assumed accordingly. The remaining 5 pairs, as well as 3 more pairs whose fingerprints gave inconclusive results, were classified as of unknown zygosity.

RESULTS AND DISCUSSION

From the total of 79 pairs of same-sex twins, 56 were assumed monozygotic (MZ), 15 dizygotic (DZ) and 8 as of unknown zygosity. The pairs were subdivided according to concordance in each of the behavioral characteristics, ie, whether one or both cotwins manifested the characteristic, thereby excluding those cases where neither twin manifested it. Concordance values of MZ pairs were compared to those of DZ pairs and the significance of the difference was calculated by Fisher's exact test (Table).

Rates of DZ twinning are known to be much lower in Japan than in Caucasian populations, with same-sex DZ twinning accounting for about 20% of all twin births [8] – a figure that holds true in our sample as well, our 15 same-sex DZ twins representing 21% of the total sample.

The present study confirmed the results of earlier twin studies on motion sickness, enuresis, restlessness and persistent finger-sucking [4] and stranger anxiety. Other items which showed a significant difference in concordance between MZ and DZ pairs are the child's reaction to sudden noise and to being left alone in bed. They appear, like stranger anxiety, related to fear in early childhood. Studies of adult twins showed that the phobic anxiety subscale of the Middlesex Hospital Questionnaire had the highest genetic loading [18] and that the content of phobic fears and the kind of situation a person most fears

are influenced by genetic factors [17]. A fear survey administered to adolescent and adult twin pairs demonstrated a significant genetic influence in self-assessed common fears [11, 12]. These findings and our study suggest that fear is one of the genetically influenced components modifying human behaviours from early stages of life.

We hesitate to draw a final conclusion on Item 4-7, for the number of twins is small at present and we may obtain a significant difference in concordance in one or two of these items as we continue our study and the sample size is increased.

TABLE - Concordance for Examined Characteristics in MZ and DZ Twin Pairs

		No. of pairs with characteristic		MZ-DZ comparison
		Both twins	One twin	P
1) Marked fear of strangers in infancy	MZ	13	2	0.012
	DZ	0	3	
2) Startled by sudden noises in infancy	MZ	14	2	0.016
	DZ	1	4	
3) Able to sleep alone without a parent sitting nearby	MZ	22	1	0.003
	DZ	4	5	
4) Regular rhythm of sleep and appetite	MZ	32	3	ns
	DZ	12	0	
5) Falls asleep promptly at bedtime	MZ	13	5	ns
	DZ	5	5	
6) Finger- or thumb-sucking	MZ	10	8	ns
	DZ	1	4	
7) Stubborn, does not listen to the mother	MZ	10	10	ns
	DZ	2	6	
8) Motion sickness	MZ	8	3	0.013
	DZ	0	5	
9) Enuresis	MZ	18	4	0.040
	DZ	2	4	
10) Short attention span or restlessness during the test	MZ	6	5	0.058
	DZ	0	5	
11) Stranger anxiety during the test	MZ	10	2	0.038
	DZ	1	4	

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