BEHAVIORAL DEVELOPMENT OF YUCHENG CHILDREN AS COMPARED TO THEIR MATCHED CONTROLS

HSU C.C., HU H.F., LAI T.J., KO H.C.,CHEN Y.C.
Department of Psychiatry, National Cheng-Kung University Medical College, 138 Sheng Li Road, Tainan, Taiwan, Republic of China

We have been following up the behavioral development of each one of the 118 pairs of Yucheng and his/her matched control child,since August 1986. We utilized revised Chinese versions of Rutter's Behavior Rating Scales for Parents[1] and Werry-Weiss-Peters Activity Check List for Parents[2]. Each year, the behavior and activity questionnaires were filled out by a parent under the instruction of a trained interviewer. The matched control was evaluated on the same day as the Yucheng child. Paired t-tests were used to compare the mean difference in the scores of each pair of Yucheng and his/her matched control child. One hundred and thirteen pairs of study children completed seven-year follow-up which is to be carried on for 5 more years. Because the children were born over a eight-year period, ranging from 1978 to 1985, they were of different ages in each round of follow-up. Table 1 shows the distribution of Yucheng children by age in the 1st field study, August 1985.

As shown in table 2, starting from 1985,Yucheng children have been consistently rated by mothers to manifest higher activity level. The mean of difference between the two children in each pair of the two groups was statitistically significant each year.

Table 1.Distribution of Yucheng children by ages

Age	No of children
below 1	7
≥ 1 below 2	23
≥ 2 below 3	20
≥ 3 below 4	23
≥ 4 below 5	14
≥ 5 below 6	10
≥ 6 below 7	16
≥ 7 below 8	5
Total	118

Table 2. Comparison by activity scores and by year of study

Year of study	Group	Scores $\bar{X} \pm$S.D.	Mean of difference	Paired t-value	P value
1985 (n=72)	Yucheng	47.9±21.9	6.4	2.16	.034
	Control	41.5±18.8			
1986 (n=92)	Yucheng	48.0±17.4	10.6	4.13	.000
	Control	38.0±14.7			

1987 (n=105)	Yucheng Control	42.6±16.1 35.7±17.8	6.9	3.72	.000
1988 (n=116)	Yucheng Control	44.1±17.4 39.9±16.8	4.2	2.07	.041
1989 (n=112)	Yucheng Control	39.0±15.9 35.4±16.3	3.6	2.03	.045
1990 (n=97)	Yucheng Control	36.6±19.3 28.5±18.6	11.1	5.71	.000
1991 (n=87)	Yucheng Control	30.7±13.4 24.4±12.6	6.4	2.62	.011

On Rutter's Behavior Scale a similar trend as activity level appeared, i.e.,Yucheng children have been rated to manifest more health,habit and behavior problems.

Table 3. Comparison by scores on Rutter's Scale

Year	Rutter's Subscale	Group	Mean±S.D	Mean of difference	Paired t-value	P value
1985 n=118	Health problem	Yucheng Control	11.4±2.8 10.1±1.3	1.3	4.37	.000
	Habit problem	Yucheng Control	28.6±5.6 28.2±5.4	0.4	0.89	.373
	Behavior problem	Yucheng Control	5.6±2.0 5.4±1.7	0.2	0.27	.68
1986 n=118	Health problem	Yucheng Control	3.4±2.3 4.1±2.7	2.1	2.19	.029
	Habit problem	Yucheng Control	2.9±1.1 2.6±0.8	0.4	2.85	.055
	Behavior problem	Yucheng Control	11.6±5.5 10.8±4.9	1.0	1.05	.296
1987 n=116	Health problem	Yucheng Control	4.7±2.1 3.3±2.0	1.3	2.51	.013
	Habit problem	Yucheng Control	3.6±1.6 2.5±1.7	0.8	1.42	.067
	Behavior problem	Yucheng Control	9.1±4.2 7.5±4.6	1.5	2.73	.007
1988 n=116	Health problem	Yucheng Control	4.3±2.3 3.4±1.8	0.9	3.66	.000
	Habit problem	Yucheng Control	3.6±1.6 2.9±1.8	0.7	3.35	.001
	Behavior problem	Yucheng Control	9.7±4.1 7.8±4.0	1.8	3.69	.000
1989 n=115	Health problem	Yucheng Control	3.7±2.1 3.0±1.8	0.7	3.25	.001
	Habit problem	Yucheng Control	1.3±1.3 1.0±1.1	0.3	2.03	.045

	Behavior problem	Yucheng Control	11.1±5.2 9.2±5.0	1.9	3.13	.002
1990 n=114	Health problem	Yucheng Control	3.8±2.2 2.4±2.1	1.4	5.89	.000
	Habit problem	Yucheng Control	1.2±1.3 0.7±1.0	0.5	3.67	.000
	Behavior problem	Yucheng Control	9.9±5.7 7.4±4.9	2.4	5.01	.000
1991 n=113	Health problem	Yucheng Control	3.4±2.1 2.5±1.6	.8	3.45	.001
	Habit problem	Yucheng Control	0.6± 0.9 0.3±0.6	.3	3.48	.001
	Behavior problem	Yucheng Control	11.6±5.6 8.4±5.0	3.1	5.00	.000

We also evaluated the temperamental characteristics of Yucheng children and found out that Yucheng children had been rated by parents to have higher activity (1990, 1991 field work), irregular rhythmicity (1986, 1987, 1988 rounds), lower adaptability (1986, 1988 rounds) ,negative quality of mood (1986, 1988, 1989 rounds), higher intensity of reaction (1986, 1989 rounds). Most of these temperamental items belong to the so-called "difficult to raise" or "A factors", but the trend in this regard has not been as consistent as activity and behavioral scores. We also have data from Teacher's Activity Check List which indicate that Yucheng children have been rated by teachers to manifest higher activity level. This appears to underscore the results of the parent's ratings. Because the two children of each of the118 pairs have not been in the same class room, so we only regard this data as supplemental.

So far there have been two behavioral items, i.e. higher activity level and higher scores on the Rutter's Behavior Rating Scale,which have been consistently observed throughout the past seven years. The Japanese Yusho children were described as hypotonic, apathetic, and dull at ages 9 and 10[3]. Since these children lived on an isolated small island, and no controls were compared, the observation may not represent the whole picture of Yusho children. Rogan and Gladen[4] found that children with prenatal or transmilk exposure to background levels of PCBs were rated by parents to show possible hyeractivity. The study, however, did not find any association between prenatal PCBs exposure and activity levels. Jacobson et al[5] reported that the composite activity rating at age 4 was not related to prenatal PCBs exposure. Behavioral effects were reported in animals prenatlly exposed to PCBs.The most consistent finding is hyperactivity among in utero PCBs exposed mice, male rats, and rhesus monkey[6-11]. At present we have only 31 Yucheng children on whom we have serum PCBs and PCDF levels. The result of preliminary analysis failed to yield dose response relation between PCBs/PCDF levels and activity levels and scores on Rutter Scale.

WE are not, now, in a position to hypothesize that the persistently higher activity levels and more health, habit and behavior problems in Yucheng children are due to direct prenatal exposure to heat-degraded PCBs. The parents who perceive their Yucheng children as "abnormal" or "damaged" might have contributed to the differences in reported activity levels and health, habit and behavioral problems.

This possibility has to be carefully taken into consideration in our further analysis of the cumulated voluminous data and in our future follow-up of the study children.

References:

1. Rutter M., Tizard J., Whitmore K. Appendix 6. Children's behaviore questionnaire for completion by parents. In: Education, Health, and Behavior: Psychological and Medical Study of Childhood Development. New York: Wiley; 1970:412-421.
2. Hsu C.C., Lin T.J. ,Kuo H.L..A preliminary study of the activity level of Chinese children aging three to eleven years. [in Chinese;English summary]. Natl Sci Counc Monthly, R.O.C. 1982;10:363-381.
3. Harada M. Intrauterine poisoning: clinical and epidemiological studies of the problem. Bull Inst Const Med Kumamoto Univ. 1976;25 Suppl:1-69.
4. Rogan WJ, Gladen BC. Neurotoxicology of PCBs and related compounds. Neurotoxicology. 1992;13:27-35.
5. Jacobson JL, Jacobson SW, Humphrey HEB. Effects of exposure to PCBs and related compounds on growth aand activity of children. Neurotoxicol Teratol. 1990; 12:.319-326.
6. Tilson HA, Jacobson JL, Rogan WJ.Polychlorinated biphenyls and the developing nervous system: cross-species comparisons. Neurotoxiccol Teratol. 1990; 12:239-248.
7. Tilson Ha, Davis GJ, Mclachlan JA, Lucier GW. The sffects of polychlorinated biphenyls given prenatally on the neurobehavioral development of mice. Environ Res. 1979;18:466-474.
8. Chou SM, Mike T,Payne WM, Davis GJ. Neuropathology of "spinning syndrome" induced by prenatal intoxication with a PCB in mice. Ann NY Acad Sci. 1979; 320:373-395.
9. Shiota K. Postnatal behavioral effects of prenatal treatment with PCBs in rats. Okajima Folia Anat. Jpn. 1976;53:105-114.
10. Bowman RE,Heironimus MP, Barsotti DA. Locomotor hyperactivity in PCB-exposed rhesus monkeys.Neurotoxicology. 1981,;2:251-268.
11. Bowman RE, Heironimus MP. Hypoactivity in adolescent monkeys perinatally exposed to PCBs and hyperactive as juveniles. Neurobehv Toxicol Teratol. 1981; 3:15-18.