

## An Evaluation of the Effectiveness of the Mental Developmental Screening Tests in a Practical Field

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(Received Oct.1, 1990)

### Abstract

The purpose of this paper is to evaluate the effectiveness of the mental developmental screening tests, the Ohtu method and DPDQ, in the practical field by comparing the detection rate of mental abnormality after practicing screening tests with the detection rate of it before practicing them.

The detection rate differs significantly at  $p < .001$ . Before practicing screening tests, mentally abnormal infants, especially mentally retarded infants with unclear medical causes could not be detected.

This study shows that even if the mental developmental screening tests now used are imperfect, it is useful to practice them at medical examinations.

Key words : DEVELOPMENT, DPDQ, INFANT, SCREENING

The World Health Organization Regional Office for Europe had a meeting on "the Early Detection of Handicap in Children" in Faro, Portugal, from 15 to 18 May 1979. In that meeting Wagner<sup>1)</sup> reviewed the historical background to that meeting :

"Industrialization had led to a reduction in mortality and in birth rates, with the result that health services were now able to concentrate on the quality of life of populations. It was clear to WHO that the quality of newborn children was one of the major features determining the quality of ultimate life, so that the appropriate management of reproduction or child birth, together with the early detection of disease through mass screening campaigns, had initially been seen as a major concern for the Region."

Not only in Europe but also in almost every developed country, including Japan, we have the same history.

In the report of this meeting, 17 recommendations are listed. One of them is "Every child should be monitored from the point of view of growth and general development."<sup>2)</sup>

Among the aspects of growth and general development, mental development is one of the

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most important factors. And monitoring this development is begun by screening. The screening of mental development is most important for children's general development.

There are various studies about mental developmental screening tests. In Japan there is a unique mental developmental screening test named the Ohtu method. The Ohtu method has been practiced in Ohtu city, Shiga prefecture in Japan from 1974. This method consists of some questions and tests. Tanaka & Tanaka<sup>3)</sup> explained this method in detail. Outside of Ohtu city, and of course outside of Japan, there has been no study about the Ohtu method.

Meisels<sup>4)</sup> said that "The most frequently used screening instrument for detecting young children who are at risk for developmental delays is the Denver Developmental Screening Test (DDST)." And he<sup>5)</sup> added that "As the most widely used screening test worldwide, it has been translated into numerous languages and restandardized in more than a dozen countries."

The questionnaire which was transformed from the DDST is called the Denver Pre-screening Developmental Questionnaire (DPDQ). The DPDQ was translated into Japanese by Ueda.<sup>6)</sup> Studies about the DPDQ are the study comparing the DPDQ with the DDST,<sup>7)</sup> the study applying the DPDQ in a low-income population<sup>8)</sup> and the study revising the DPDQ.<sup>9)</sup>

There has been no study demonstrating the effectiveness of the DPDQ in a practical field. Specifically, there has been no study comparing the detection rate of mental abnormality after practicing the DPDQ with the rate before practicing the DPDQ. And there has been no study comparing the detection rate of mental abnormality after practicing the Ohtu method with the rate before practicing the Ohtu method, either.

The purpose of this paper is to evaluate the effectiveness of mental developmental screening tests, the Ohtu method and DPDQ, in the practical field by comparing the detection rate of mental abnormality after practicing screening tests with the detection rate of it before practicing them.

## Method

The field in which I have studied is Sawauchi village in Japan. This village is famous for its health service system, especially its maternal and child health care system. Araki<sup>10)</sup> stated, "It was a remarkable record which was miraculous for the villagers when they realized that the infant mortality rate of the village had been reduced to zero...it was in 1962 when this extraordinary drop in infant mortality occurred."

I started to study in this village at 1982 as a psychologist. I have taken part in the medical examinations of infants from 0 to 5 years old. At the examinations, in order to check their mental development I have used the Ohtu method for 4,5,10 and 11 months old infants and DPDQ for other age infants under 5 years old.

From 1982 to 1984 I detected 32 infants who were mentally abnormal. The years when these 32 infants were detected and the number of subjects examined each year are shown in Table 1.

Table 1. The numbers of mentally abnormal infants and number of medical examination subjects annually

year	1978	1979	1980	1981	1982	1983	1984	unknown
abnormal infants	1	1	1	1	7	11	8	2
subjects	331	331	346	347	343	334	330	

These 32 infants are the subjects of this paper. The sorts of abnormalities and the years when they were detected are shown in Table 2.

Table 2. The sorts of abnormality and the years when they were detected

	'78	'79	'80	'81	'82	'83	'84	unknown
Mental R*without cause	0	0	1	0	2	5	4	0
Emotional disorder	0	0	0	0	1	1	1	0
Language disorder	0	0	0	0	0	2	0	0
Environmental mental R*	0	0	0	0	0	0	1	1
Mental and movement R*	1	0	0	0	1	0	0	0
Mental R*at risk	0	0	0	0	0	0	1	1
Language R*	0	0	0	0	1	0	0	0
Abnormal onanism	0	0	0	0	0	1	0	0
Learning disorder	0	0	0	0	0	0	1	0
Borderline	0	0	0	0	1	0	0	0
Autism	0	0	0	0	1	0	0	0
Down's syndrome	0	0	0	0	0	1	0	0
Infantile spasms	0	1	0	0	0	0	0	0
R*by neonatal meningitis	0	0	0	0	0	1	0	0
R*by epilepsy	0	0	0	1	0	0	0	0

\*R : retardation

Before 1981 I had not participated in the medical examinations in this village. Only a pediatrician and public health nurses had done medical examinations. After 1982 I took part in them and practiced mental developmental screening tests using the Ohtu method and DPDQ.

Using the "Binomial test"<sup>(11)</sup> I tested the null hypothesis that the probability which mentally abnormal infants had been detected before 1981 was the same as after 1982. That is, the probability which mentally abnormal infants had been detected before 1981 was .5, and

the probability after 1982 was the same .5. Except for the unknown 2 cases shown in Table 1 I used the "Binomial test".

As shown in Table 2, there are more abnormal infants whose medical causes of abnormality were unclear after 1982 than before 1981. As shown in Table 2, in which the medical causes of abnormality above the dotted line are unclear, there are more infants who have unclear medical causes after 1982 than before 1981. In order to clarify this point, except for the unknown 2 cases shown in Table 2 I used the "Fisher exact probability test Tocher's modification".<sup>12)</sup>

### Results

The result of the "Binomial test" is shown in Table 3. As shown in Table 3, the probability that the mentally abnormal infants were detected differs significantly at  $p < .001$ .

Table 3. The result of Binomial test

	1978~1981	1982~1984
detected cases	4	26

Binomial test

$$Z = \frac{(x + .5) - NP}{\sqrt{NPQ}} = -3.83 \quad (x = 4 \quad N = 30 \quad P = Q = .5)$$

$$p < .001$$

The result of the "Fisher exact probability test Tocher's modification" is shown in Table 4. This shows that the probability of significant difference at  $p < .05$  is .65.

Table 4. The result of Fisher exact probability test  
Tocher's modification

	1978~1981	1982~1984
unclear causes	2	24
clear causes	2	2

Fisher exact probability test Tocher's modification

$$\frac{\alpha - P \text{ more extreme cases}}{P \text{ observed case taken alone}} = .65 \quad (\alpha = .05)$$

## Discussion

Table 3 shows that more mentally abnormal infants were detected after 1982 than before 1981. Table 4 shows that more mentally abnormal infants with unclear medical causes were detected after 1982 than before 1981. The difference between before 1981 and after 1982 is that mental developmental screening tests were not practiced before 1981 but they were practiced after 1982.

Meisels<sup>13)</sup> discussed the validity of mental developmental screening as follows :

“However, there are few such validated tests, particularly for infants and toddlers. More research in this area is urgently needed, and the authors of existing instruments that do not have adequate validity should consider revising and restandardizing their tests.”

In fact, mental developmental screening tests are imperfect now. Efforts to improve them are needed.

But the results of this study show that it is useful to practice mental developmental screening tests at medical examinations. Even if the mental developmental screening tests now used are imperfect, if we did not practice them, we would be unable to detect mentally abnormal infants, especially mentally retarded infants with unclear medical causes.

If it is possible, in addition to pediatricians and public health nurses, psychologists should take part in medical examinations and practice mental developmental screening tests.

This paper was translated by Azuma from the part of “Seishinhattatu Screening to Jigoystem toshitenno Boshiclass nituiteno Kenkyu—Hekison niokeru Chiiki Boshihokensystem nikansuru Jissenkenkyu yori—” (Japanese) which appeared in “Shoni Hoken Kenkyu Vol.48 No.1 1989 Tokyo”.

The author wishes to thank Mr. Kenneth R. Eineke for checking English sentences of this paper.

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