

The effectiveness of early intervention and the factors related to child behavioural problems at age 2: A randomized controlled trial

Shunyue Cheng^a, Naoji Kondo^b, Yutaka Aoki^c, Yumi Kitamura^d,
Yasuhisa Takeda^a, Zentaro Yamagata^{a,*}

^a Department of Health Sciences, School of Medicine, University of Yamanashi, 1110 Shimokato, Chuo, Yamanashi, Japan

^b Yamanashi Prefectural Mental Health Welfare Center/Yamanashi Prefectural Central Child Guidance Center, Japan

^c Soshu Mental Clinic, Japan

^d Department of Psychiatry, Tokai University Hospital, Japan

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relationship;
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Home visit;
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Abstract

Background: The aim of this study was to assess the effectiveness of early home-based intervention as a community health service and evaluate the influence of both early maternal depression and mother–infant relationships on child behavioral problems at age 2 in a longitudinal setting.

Methods: A randomized controlled trial was conducted in this study. A total of 95 mother–infant pairs were assigned randomly to intervention (48) or control (47) groups. The intervention group received monthly specific home visits between the infant ages of 5 and 9 months while the control group received only routine center-based services. Maternal depression and the mother–infant relationship were assessed by medical checkups at the ages of 4 and 10 months. Child behavioral problems were assessed at age 2.

Results: The intervention had no significant impact on child behavioral problems. However, for mothers who had a disturbed relationship with their infants, the rate of improvement in the quality of the relationship was higher in the intervention group. Disturbed mother–infant relationships at 10 months and early maternal depression significantly increased the risk of high scores on the Child Behavior Checklist (CBCL).

Conclusions: These findings indicate that intervention is most likely to have a positive impact on the quality of mother–infant relationships in cases where the relationship is disturbed and that a disturbed mother–infant relationship and maternal depression during infancy are relevant to the future mental health of the child. To prevent difficulties in child functioning, more prolonged interventions focusing on disturbed mother–infant relationships may be required.

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* Corresponding author. Tel.: +81 55 273 9564; fax: +81 55 273 7882.
E-mail address: zenymgt@yamanashi.ac.jp (Z. Yamagata).

1. Introduction

Behavioural problems in children are an important social, educational, and health issue. Data from several longitudinal studies suggests a remarkable continuity in childhood behavioural/emotional problems and psychopathology starting from infancy and toddlerhood [1–5]. For example, in a study conducted in Dunedin, antisocial behaviour at age 13 was predicted by externalizing behaviour exhibited at age 3 and behavioural problems at age 5 [6].

There is evidence that the caregiver environment during the first few years of life is particularly important for predicting externalizing disorders at school entry; this is consistent with both social learning and attachment models [7]. Maternal sensitivity in particular is a core aspect of an infant's early interactive experiences and his/her socio-emotional development [8] as well as communication with the mother [9]. Van den Boom [10] reported improvements in the quality of mother–infant interaction, infant exploration, and attachment following the implementation of a program to enhance maternal sensitive responsiveness among a group of mothers from low-income families. The abovementioned study provides support for the view that maternal sensitivity to the infant is a crucial factor in the development of secure attachment.

There has been a considerable volume of research on the effectiveness of interventions in solving problems in the mother–infant relationship in general [11–13]. Home-based interventions during the early years of an infant's life have shown promise in preventing child abuse and neglect, enhancing child development [14,15], and having a long-term positive impact on children's educational, behavioural, and psychiatric outcome [14,16]. Maternal mood and maternal mood disorders in the postpartum period have a significant influence on children's development and their long-term outcome [17,18]; this effect is probably mediated by a disturbance in the maternal–infant attachment relationship as a result of mood disorder in the mother.

After the Second World War, Japan strove to improve the physical aspect of maternal and infant care and established a nationwide prenatal and infant screening system that produced an infant mortality rate that was the lowest in the world as well as a compliance rate of more than 80% for infant checkups. However, the increasing incidence of child abuse, juvenile crimes (e.g., murder and robbery), eating disorders, and other emotional and behavioural problems among children prompted the government and public to reconsider the importance of the early intimate mother–infant relationship. The creation of a secure base for families to enjoy a nurturing companionship with their infants is now a common goal of infant mental health programs in Japan. In addition, although some studies have attempted to improve disturbed mother–infant relationships, there is currently insufficient conclusive evidence regarding the role of parenting programs in the primary prevention of mental health problems as a part of mother–infant health care-related community service in Japan.

As a pilot for a possible controlled intervention study, we conducted a preliminary study of early home-based intervention focusing on the mother–infant relationship in a community sample in Japan. The intervention was designed to improve the quality of the mother–infant relationship by

using a program to enhance maternal sensitive responsiveness toward infants. The aims of this study were as follows: (1) to assess the effectiveness of early home-based intervention in improving the mother–infant relationship, (2) to assess the role of early intervention in this relationship in the primary prevention of behavioural problems, and (3) to evaluate the influence of related factors including early maternal depression, the mother–infant relationship, and other characteristic factors on child behavioural problems at age 2 in a longitudinal setting.

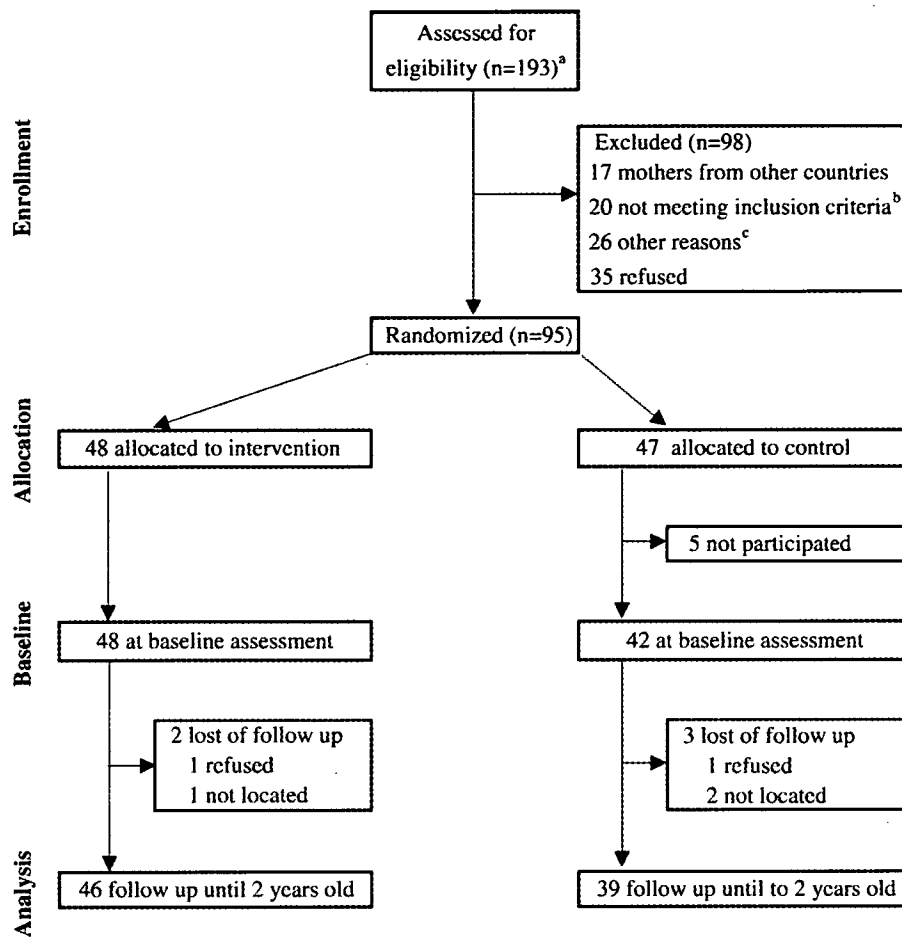
2. Methods

2.1. Subjects

This study was conducted in the Tatomi Health Care Center in Yamanashi Prefecture, Japan. Tatomi is a small town with a population of 16,866, and the number of live births per year is approximately 180. To ensure the implementation of the program, the sampling was conducted in three periods. Seventy-five mothers with infants born between June and September 2000 were selected in the first period; 62 mothers with infants born between April and July 2001, in the second period; and 56 mothers with infants born between February and May 2002, in the third period. Among these pairs, mothers of other nationalities, those who planned to move out of the region, or those who could not be contacted were excluded. Since we targeted the general population, we also excluded infants who did not meet the inclusion criteria due to low birth weight, premature delivery, or congenital abnormalities. We obtained the informed consent of 130 mothers for participation in this study and excluded those who refused to consent (35). A total of 95 mother–infant pairs were recruited to participate in the baseline assessment, and they were randomly assigned to an intervention group (48 pairs) or a control group (47 pairs). A random number table was computer generated and used to determine the intervention status; this was performed by a clerical officer who was not involved in determining eligibility. However, among the mothers in the control group, five did not participate in the baseline assessment and three were dropped out the follow-up, while only two mothers from the intervention group dropped out. Thus, 85 pairs were followed until the infant reached 2 years old (Fig. 1). Most of the mothers (95%) had completed high school, and most families (99%) were two-parent families. More than half of the incomes (58%) were at or over 4 million Japanese yen per year. The mean age of the mothers was 30 ± 4.4 years (range 17–45) at the baseline of the study.

2.2. Procedures

Mothers in both the intervention and control groups completed questionnaires on the Center for Epidemiologic Studies Depression Scale (CES-D) and demographic characteristics by using a self-report at the time of the infant medical checkup at 4 months. Further, the infants and their mothers were observed for 10 min while playing with a standard set of toys in a laboratory playroom at the health-care center. This free play was videotaped, and the video recording was used to assess the mother–infant relationship



^a Infants were born during from Jun to September 2000 (n=75), from March to July 2001 (n=62) and from February to may 2003 (n=56).

^b Low birth weight, premature delivery and congenital abnormalities.

^c Not able to contact or planned to move out.

Figure 1 Flow of the participants through each stage of the randomized trial.

using the Parent–Infant Relationship Global Assessment Scale (PIRGAS). Based on this assessment, we then determined a plan of intervention for the first home visit. After five home visits, at the time of the infant medical checkup at 10 months, the observation of mother–infant free play and the investigation of maternal depression were repeated at the health-care center in the same manner as in the baseline assessment. When the children reached the age of 2, the mothers completed the Child Behavioural Checklist (CBCL) for the assessment of child behavioural problems.

2.3. Intervention

The control group received standard center-based service that included the provision of education regarding parenting, infant nutrition, development, physical health, and other services in conjunction with infant medical checkups. In addition, psychological counseling was made available in the town, thereby allowing the mothers to respond positively to the various difficulties of parenting. The intervention group received these standard center-based services as well as

monthly specific home visitation by a public health-nurse for a period of 5 months; this was designed to enhance the affective interaction between mother and infant. Five home visits, each extending for a period of at least 1 h, were conducted while the infant was between 5 and 9 months old. The nurses were all female and each nurse visited eight families. The nurses received special training regarding the provision of support to the mothers aimed at improving the quality of mother–infant relationships. They tailored their home visits to suit the individual needs of the families. Their main activities were to provide appropriate support for the problems in mother–infant interaction that influence the functioning of mother–infant relationships. The aim of this visitation was to promote maternal feelings of competence in infant caretaking as well as to improve maternal sensitivity and the quality of mother–infant interactions through modeling or positive feedback. To accomplish these goals, assessment meetings to determine home visit guidelines were conducted by psychiatrists and a clinical psychologist before each home visit. The intervention procedure during the home visits can be described as

Table 1 Comparison of the baseline characteristics between the two groups

Characteristics	Intervention	Control	<i>p</i> ^a
	(<i>n</i> =46)	(<i>n</i> =39)	
	<i>n</i> (%)	<i>n</i> (%)	
Maternal age (≥ 30 years) ^b	20(43.5)	16 (41.0)	0.497
Maternal Education (\geq high school)	44 (95.7)	36 (92.3)	0.421
Birth order (first-born child)	25 (52.2)	18 (43.9)	0.385
Household income (<4 million yen/year)	19 (40.4)	18 (43.9)	0.742
Male child	22(47.9)	18 (56.4)	0.555
Mothers with history of childhood maltreatment	5 (10.8)	4 (10.3)	0.981
Maternal depression (CES-D score ≥ 16)	4 (8.7)	4 (10.3)	0.369
Disturbed relationship	19 (41.3)	18 (46.2)	0.844

^a Chi-square or Fisher's exact probability test.

^b Mean age of mothers.

follows. First, to observe the interactions between the mother and infant at home, the mothers were asked to play freely with their infants for 10 min. The points observed were the following. (1) For the infants: cues (engagement or disengagement cues), laughter, movement, interest, eye contact, response to the mother, exploratory behaviour, stranger wariness, emotion sharing, social reference, and reciprocal play. (2) For the mothers: the ability to ensure the safety of the infant, interest in the infant, sensitivity, stimulation, encouragement, talking, and intrusion. Second, information regarding the mothers' childcare behaviour (feeding, playing, bathing, and changing of clothes; and behaviour pertaining to the infants' excreting, sleeping, and crying) was obtained through interviews with and self-reports by the mothers. Finally, encouragement in the form of praise for the positive aspects of mother–infant interaction and professional suggestions were given to those who appeared to be maladjusted; this was done in accordance with the predetermined intervention guidelines. The nurses maintained detailed records and provided information about the situation of each family for each home visit under supervision at assessment meetings.

2.4. Measures

The observations of the mother–infant relationship that were made in the playroom at 4 and 10 months of infant age were videotaped. All the interactions took place during the afternoon, after it was ascertained that the infants were not hungry. The mothers were asked to diaper and play with their children exactly as they would usually do at home. During the recordings, the camera was directed mainly toward the faces of the mother and infant. Each video recording lasted 10 min. The PIRGAS [19] was used to assess the quality of the mother–infant relationship adaptation. A child psychophysiology expert who was unaware of group assignment and other particulars reviewed the videotapes of the free play

sessions and rated the overall level of relationship adaptation by using the PIRGAS. Another expert reviewed the videos to assess the inter-rater reliability; Cohen's κ for the assessment of the relationship adaptation was 0.53. The PIRGAS scale is a continuously distributed scale of parent–infant relationship functioning and ranges from 90 (well-adapted) to 10 (dangerously impaired). Nine anchored points define differing levels of relationship adaptation. According to classification by this scale, the mother–infant relationship adaptation shows no evidence of significant psychopathology when the PIRGAS score is 80 points or more; on the other hand, a score of less than 80 points indicates that the relationship is functioning in a less than optimal or slightly maladapted manner. Therefore, we defined the group that scored 80 points or more as an adapted group and the group that scored less than 80 points as a disturbed group. The reliability and validity of this method for the prediction of child behavioural problems has been reported [20–22].

Maternal depression was assessed using the Japanese version of the CES-D [23]. The questionnaire was administered to mothers when their infants were 4 and 10 months old. A cut-off of 16 points or more was used to distinguish between depressed and non-depressed individuals. The validity and reliability of this measurement has been previously demonstrated [23].

We evaluated the internalizing, externalizing, and total scores of the children's behavioural problems at age 2 by using the Japanese version of the CBCL [24,25] for ages 2–3 (CBCL/2-3), which was completed by the mothers. The Japanese CBCL/2-3 comprises 100 symptoms rated by the mothers and has three rankings based on their judgment: 0 (not true), 1 (somewhat true), and 2 (very or often true). The checklist determines scales for total behavioural problems and composite internalizing and externalizing behavioural problems. The internalizing behavioural problems covered in the Japanese CBCL/2-3 are withdrawn behaviour, separation anxiety, and anxious/neurotic domains; the externalizing behavioural problems cover oppositional, aggressive/destructive, and attention domains. The domains of development and sleep/eating belong to neither internalizing nor externalizing behavioural problems. The raw scores on each scale and domain can be converted into *T* scores that are based on normative data. The internal consistency and test–retest reliability of these subscales of *T* are standardized as the Japanese CBCL/2-3, which was previously validated by Nakata et al. [25].

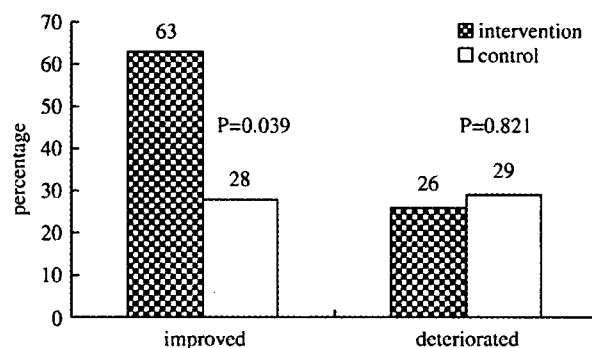


Figure 2 Percentage of "improved" and "deteriorated" quality of mother–infant relationship adaptation at 10 months old.

Table 2 Comparison of CBCL scores between categories of independent variables

Variable	n	Mean (SD)		
		Total problems	Internalizing problems	Externalizing problems
Educational level of mother				
≤ High school	41	27.0±13.8	5.2±3.9	16.2±7.9
> High school	44	25.8±13.7	5.6±4.4	14.6±8.5
Maternal age				
< 30 years	49	26.7±15.5	5.9±4.7	15.6±9.2
≥ 30 years	36	26.0±10.9	4.8±3.3	15.1±6.7
Family income per year (tens of thousands of yen)				
< 400	36	26.5±15.5	5.4±4.6	15.7±9.1
≥ 400	49	26.3±12.3	5.5±3.9	15.1±7.5
Birth order of the infant				
First	42	28.1±14.5*	6.2±4.4	15.8±8.3
Other	43	24.7±12.7	4.7±3.9	14.9±8.1
Infant's sex				
Female	45	28.4±14.4*	5.8±4.3	16.1±8.5
Male	40	24.1±12.5	5.0±4.0	14.6±7.8
Mothers with history of childhood maltreatment				
Yes	9	30.6±14.1*	5.6±4.4	18.9±9.4*
No	76	25.9±13.6	5.4±4.2	15.0±8.0
Maternal depression at 4 months				
Depression	8	35.6±19.3**	8.0±5.4**	19.8±12.2*
Non-depression	77	25.4±12.7	5.2±3.9	14.9±7.6
Maternal depression at 10 months				
Depression	9	31.7±19.2*	7.1±6.0	17.9±12.3
Non-depression	76	25.8±12.9	5.2±4.0	15.1±7.6
PIRGAS score at 4 months				
Disturbed relationship	37	25.7±13.9	5.4±3.9	15.1±8.9
Adapted relationship	48	26.9±13.5	5.5±4.5	15.6±7.6
PIRGAS score at 10 months				
Disturbed relationship	33	28.6±14.2*	6.2±4.1*	16.7±8.9*
Adapted relationship	52	24.9±13.2	4.9±4.2	14.5±13.0
Intervention				
Intervention	46	24.9±11.8	5.6±4.4	14.2±7.0
Control	39	27.6±15.1	5.2±3.9	16.4±8.9

*** $p < 0.0001$; ** $p < 0.001$; * $p < 0.05$. Analyses were performed with Mann–Whitney tests.

The baseline information provided by the mothers' self-reports included characteristics such as maternal age, maternal educational level, family income, family structure, maternal employment, and maternal history of childhood maltreatment, child sex, and child birth order.

3. Statistics

The chi-square and Fisher's exact tests were used to compare the demographic characteristics of the intervention group with those of the control group at the baseline as well as the improvement rates in the mother–infant relationship adaptation in the two groups. The differences in the CBCL scores for the categorical variables were tested by using the Mann–Whitney test in the appropriate manner.

Multiple logistic regression analyses were used to examine the association between behavioural problems in 2-year-old children and early intervention, the early mother–infant relationship, maternal depression, and a maternal history of childhood maltreatment. Odds ratios (OR) and 95% con-

fidence intervals (95% CI) were calculated. A p value of less than 0.05 was interpreted as significant. The baseline variables of maternal age, maternal education, and household income, birth order of the infant and infant sex were entered into the regression model as covariates. All analyses in this study were performed using the Statistical Analysis System, Version 9.0 (SAS Institute Inc., Cary, NC, USA).

4. Results

At the two-year follow-up, 85 mother–infant pairs (46 in the intervention group, 39 in the control group) were available for statistical analysis. Ten (nearly 9%) of the mother–infant pairs dropped out in this follow-up study (Fig. 1). In the intervention group, among the 48 pairs at allocation, 46 pairs were followed up, and the retention was 96%. In the control group, among the 47 pairs that at allocation, 36 could be followed until 2 years of age, with retention rate of about 77%. The pairs that did and did not complete the follow-up had similar demographic characteristics.

4.1. Baseline characteristics of the two groups

The demographic characteristics of the 46 mother–infant pairs who received the full intervention as well as those of the 39 control pairs are presented in Table 1. There was no significant difference between the intervention group and the control group in any variables. There were eight mothers with a CES-D score of 16 or more, and among them, two were being treated.

4.2. Intervention effects on mother–infant relationship

Although the mother–infant relationship variable was measured on a continuous scale (PIRGAS), for descriptive purposes, we categorized our data into two relationship groups: a well-adapted group (PIRGAS score 80 or more) and a disturbed group (PIRGAS score under 80). Based on this categorization, it was observed that for the relationship group that had been disturbed relationship (37 pairs) at the baseline, the ratio of improvement (the number of pairs that entered the adapted group after receiving health-care services) was higher in the intervention group (63%, 12 pairs) than in the controlled group (28%, 5 pairs) (Fig. 2). However, in the adapted relationship group (48 pairs) at the baseline, the ratio of relationship deterioration (the number of pairs whose relationship was disturbed after they received health-care services) showed no significant difference between the intervention group (26%, 7 pairs) and the controlled group (29%, 8 pairs).

4.3. Scores on the CBCL at age 2

The respective means of the raw scores with the standard deviations (SD) were 5.4 ± 13.7 for the internalizing, 15.4 ± 8.2 for the externalizing, and 26.6 ± 13.7 for the total problem scores. According to the definition provided by the standards of the Japanese CBCL/2-3 (T scores > 64), none of the children had internalizing symptoms, three had externalizing symptoms, and two had total problems. Since there was only a small number of children whose CBCL scores were above the standard cut-off point and to facilitate analysis, the logistic regression of the raw scores were categorized by

the 75th percentile in this study. According to this definition, 28 children had internalizing symptoms and 22 had externalizing symptoms, while 23 were symptomatic on the total problem scale.

The mean CBCL scores and SD for each independent variable are presented in Table 2. The scores of infants whose mothers had a history of childhood maltreatment were significantly higher than those of infants whose mothers had no such history. The total problem scores among the girls and first-born infants were significantly higher than those among the boys and infants born later in their birth order. Maternal depression at 4 months of infant age and a disturbed mother–infant relationship at 10 months of infant age were significantly related to higher internalizing, externalizing, and total behaviour problem scores. Maternal depression when the infants were 10 months old was related only to high total problem scores. However, no significant differences were found in any CBCL raw scores between the intervention and control groups. There were no differences in the behaviour problem scores between the categories of mother–infant relationships at the age of 4 months or between different maternal ages, maternal educational levels, and family incomes.

4.4. The factors related to child behavioural problems

Table 3 shows the associations between intervention, early maternal depression, the mother–infant relationship adaptation, a maternal history of childhood maltreatment, and high problem scores. The cut-off point for the internalizing, externalizing, and total problem scores acting as dependent variables was in the upper quartile. After adjustments for potential confounders including intervention, a maternal history of childhood maltreatment, infant sex, and birth order, it was observed that maternal depression at 4 and 10 months of infant age significantly increased the risk of high total problem scores (OR=5.2, 95% CI: 1.02, 26.6; and OR=3.4, 95% CI: 1.00–15.9). Maternal depression at 4 months also increased the risk of high internalizing problem scores (OR=10.0, 95% CI: 1.81, 63.7). However, maternal depression at either infant age was not significantly related to high externalizing problem scores. A disturbed mother–infant relationship at 10 months significantly increased the risk of

Table 3 Impact of risk factors on high^a internalizing, externalizing and total problem scores, as derived by multiple logistic regression models

Variable	Internalizing problems		Externalizing problems		Total problems	
	OR	95% CI	OR	95% CI	OR	95% CI
Mother with history of childhood maltreatment ^b	0.5	0.10–2.80	2.6	0.62–10.6	3.3	0.80–14.2
Maternal depression at 4 months ^c	10.0	1.81–63.7	3.5	0.78–18.4	5.2	1.02–26.6
Maternal depression at 10 months ^c	2.6	0.55–10.5	2.7	0.58–12.1	3.4	1.00–15.9
Disturbed relationship at 4 months ^c	1.0	0.39–2.68	1.1	0.39–3.16	1.2	0.36–3.73
Disturbed relationship at 10 months ^c	3.0	1.06–8.61	5.7	1.72–18.8	4.4	1.27–14.9
Intervention ^d	0.6	0.23–1.68	0.5	0.19–1.54	0.4	0.12–1.43

^a Scores over 75th percentile.

^b Adjusted for birth order of infant, infant's sex and intervention.

^c Adjusted for infant birth order and sex, maternal history of childhood maltreatment and intervention.

^d Adjusted for infant birth order and sex, maternal history of childhood maltreatment and maternal depression at baseline.

high total, internalizing, and externalizing problem scores (OR=4.4, 3.0, and 5.7, respectively). However, a disturbed mother–infant relationship at 4 months was not associated with higher behavioural problem scores. Compared with infants whose mothers had no history of childhood maltreatment, those whose mothers did have such a history tended to be at a greater risk of high total problem scores (OR=3.3), although the 95% confidence interval was included 1 (0.80–14.2). Intervention was not significantly related to high scores on the CBCL after adjustments were made for potential confounders including a history of maternal childhood maltreatment, infant sex and birth order, maternal depression, and the quality of the mother–infant relationship at the baseline.

5. Discussion

In this study, we examined the effectiveness of home-based intervention focusing on the mother–infant relationship during infancy, and we evaluated the influence of related factors including early maternal depression, the mother–infant relationship, and a maternal history of childhood maltreatment on behavioural problems at age 2. In agreement with previous research, we found that early home-based intervention was very likely to have positive effects on the quality of the mother–infant relationship. Disturbances in the mother–infant relationship at 10 months of infant age and early maternal depression increased the risk of behavioural problems at age 2. In addition, the children of women with a history of depression during the early infancy of their children exhibited higher levels of behavioural problems as compared with children of women without a history of depression.

Van den Boom [10] reported improvements in the quality of mother–infant interaction, infant exploration, and attachment after the implementation of a program for enhancing maternal sensitive responsiveness among a group of mothers from low-income families. Wendland-Carro et al. [26] have reported that mothers in the enhancement group displayed a greater sensitivity to their infant's signals and may have thereby influenced the infant's general state of arousal and responsiveness to the environment. The above-mentioned study provides support for the view that maternal sensitivity to the infant is a crucial factor in the development of secure attachment. With regard to the mother–infant relationship, the present study showed that intervention was beneficial to those in the disturbed relationship group (PIRGAS < 80 at the baseline). At 10 months of infant age, mothers who had a disturbed relationship with their infant and received intervention showed a 35% higher rate of change to an adapted relationship than those who did not receive intervention ($p=0.039$). This finding is in agreement with Nugent's finding that an increasing parental awareness of the infant's competencies can enhance parent–infant interaction [27]; this observation is also relevant when assessing the impact of a home-based professional visiting program for vulnerable families [28]. Bakermans-Kranenburg et al. evaluated the effectiveness of various types of interventions for enhancing maternal sensitivity and infant attachment security by using meta-analyses, and their results revealed that interventions focusing on maternal sensitivity appear to be the most effective not only in enhancing ma-

ternal sensitivity but also in promoting children's attachment security. In particular, such interventions appear rather successful in improving insensitive parenting [29]. In the present study, the intervention had a greater impact on the group with disturbed mother–infant relationships as compared with the group with adapted relationships. These results provide evidence that home visit intervention during the first few months of an infant's life may improve mother–infant relationship adaptation, particularly in the case of deeply disturbed mother–infant relationships.

With regard to child behavioural problems at age 2, the intervention group received no significant benefits as compared with the control group; this was contrary to our expectations. It is possible that there is a considerable amount of normative opposition among toddlers in this age group. Therefore, it is more difficult to discern the impact of interventions on the behavioural problems of toddlers in this age group as compared with higher age groups, in which children with more enduring problems are likely to be conspicuous. A long-term follow-up will be necessary to measure the impact of this approach on the behavioural problems of such children.

In the logistic regression analysis, after making adjustments for potential confounding factors, a disturbed mother–infant relationship at 10 months of infant age continued to be significantly related to higher scores for behavioural problems at age 2, particularly externalizing problems. Zahn-Waxler et al. reported that a mother's early caretaking behaviours predicted child externalizing problems at age 5. Our findings were consistent with those of previous studies that clearly determined that the quality of the early mother–infant relationship is associated with child behavioural problems and that this effect is independent of biological factors and maternal education [4,30,31]. However, we must highlight another finding, namely, that in our study, the mother–infant relationship at 4 months of infant age was not related to later child behavioural problems. There are two possible explanations for this result. First, it is very likely that some PIRGAS scores at 4 months do not reflect the true mother–infant relationship since most mothers will strive to portray a good relationship during the video recordings and the PIRGAS cannot detect such feigned behaviour. Second, the mother–infant relationships may have changed due to the intervention.

Maternal depression at 4 and 10 months of infant age was associated with high total problem scores, particularly in the case of maternal depression at 4 months. Moreover, maternal depression at 4 months also increased the risk of high internalizing problem scores. Dawson et al. [32] have found that at 3 1/2 years of age, the children of mothers who were depressed during the early infancy of their children exhibited higher levels of internalizing and total behavioural problems and reduced generalized brain activation as measured by an EEG. The results of their study also suggest that the relation between maternal depression and child behavioural problems may be indirect on account of its association with reduced frontal brain activation and increased contextual risk factors such as marital discord and life stress. Our findings are consistent with previous research that demonstrated that infants of depressed parents are at an increased risk of behavioural problems and emotional difficulties [33,34].

Children whose mothers had a history of childhood maltreatment had a higher risk of child behavioural problems as compared with children whose mothers had no such history. Theoretically, the mother's relationship history is particularly relevant to the development of the infant's attachment to the mother because this attachment is affected by the mother's representation of her own early attachment relationships; this representation is a strong predictor of infant attachment quality [11,35,36]. Our findings suggest that a maternal history of childhood maltreatment might influence child behavioural problems by complicating the mother–infant relationship.

In our study, compared to other children, behavioural problem scores tended to be higher in first-born children. This could be partly explained by the fact that, when having their first child, parents tend to be anxious and overly concerned about this child, as suggested by Eisenman [37]. A study conducted by Aronen [38], suggested that having siblings may be a mental health promoting factor, possibly by offering a child an opportunity to develop his or her social problem solving skills and abilities to get along with other children. However, we have not considered the number of children in the statistical analysis. This is one of the limitations of our study.

The potential association of demographic characteristics such as the maternal educational level and family income with infant behavioural problems has been frequently studied, with inconsistent results. In our study, the maternal education level and family income at the baseline were not associated with the behavioural problem scores. These results may reflect the generally high educational level of most of the mothers and the small range of family incomes in this sample.

Several potential limitations should be taken into account while interpreting these results. First, a number of issues concerning the assessment of the quality of the mother–infant relationship should be considered. We assessed the mother–infant relationship using the PIRGAS, which is a comprehensive assessment method. However, it is very likely that some PIRGAS scores at 4 months do not reflect the actual mother–infant relationship since most mothers will strive to portray a good relationship during the video recordings, and the PIRGAS cannot detect such feigned behaviour. Thus, for 4-month old infants, the use of the PIRGAS alone to assess the quality of mother–infant adaptation might be inadequate, and non-differential misclassification might occur.

This study was a randomized controlled trial, but the statistical power was low because the sample size was too small. Consequently, the results are tentative. In small samples where the phenomena under consideration are infrequent, the effect of chance increases; however, there is a greater likelihood that a true association will fail to emerge as significant. Thus, unexpected findings of a lack of association, such as the finding that a history of maternal childhood maltreatment was not related to higher problem scores of the child, should not be understood as indicative of an actual lack of association. On the other hand, the confidence intervals for the odds ratio were quite large, reflecting the small sample size.

Previous studies have provided evidence that other variables may be considered risk factors for the child's outcome, e.g. child's temperament [39], the role of fathers [40],

and extended family [41]. Unfortunately, we were unable to obtain information regarding these in this study. These factors may influence the results of this study on mother–infant relationships and childhood behaviour.

In addition, the external validity of the generalization of the results of this study has to be pointed out. As reported in many studies, unacceptable rates of refusal (30%) threaten the external validity of the generalization of results. Unfortunately, it is most likely that individuals with the greatest need were the ones who declined to participate in the study [12]. Furthermore, this was a locality-based study, and the results may differ slightly among localities.

Despite these limitations, this study can be considered to be internally valid. The attrition rate in follow-up studies of this type has usually been high, with only 50% or less of the initial study group participating the follow-up [12]. This high attrition rate has hampered the interpretation of the results of such studies. In the present study, we secured a retention of almost 91%, and since it was a randomized control trial, the research is internally valid. Additionally, since the validity and reliability of scales such as the CES-D, PIRGAS, and CBCL/2-3 were already proven, this research has a high comparability with other studies. Further, our study is the first to evaluate the effectiveness of preventive intervention focusing on the mother–infant relationship in infancy with the aim of reducing child behavioural problems in Japan. Since the study focuses on the general population of a community, if the effectiveness of early intervention by home visits is recognized, such intervention could be included as a part of routine infant medical examinations.

The findings of this study have several implications. First, they indicate that intervention during early infancy is more likely to have a positive impact on the quality of the mother–infant relationship adaptation for individuals with a disturbed relationship rather than for those with an adapted relationship. However, this may not be accepted as a protective effect for behavioural problems at 2 years of age. Second, there is evidence that the quality of the mother–infant relationship and the incidence of maternal depression during infancy are relevant to the future mental health of the child. Third, the preliminary evidence in this study shows that in order to prevent difficulties in child functioning, more prolonged interventions focusing on groups with a deeply disturbed mother–infant relationship may be required.

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子と親に公衆衛生ができること

山縣 然太郎

子どもが生まれない場所

「天国の特別な子ども (Edna Massimilla 作、大江祐子訳)」という次のような詩がある。ダウン症児の母親である作家が書いたものである。会議が開かれました。地球からはるか遠くで「また次の赤ちゃんの誕生の時間ですよ」天においてになる神さまに向かって天使たちは言いました。

「この子は特別な赤ちゃんで、たくさんの愛情が必要ですよ。(中略) ですからわたしたちは、この子がどこに生まれるか、注意深く選ばなければならぬのです。」

この子の生涯が幸せなものとなるように、どうぞ神さま、この子のために素晴らしい両親を捜して上げてください。

(中略) やがて二人は、自分たちに与えられた特別の神の思召しを悟るようになるでしょう。神からおくられたこの子を育てることによって、柔和で穏やかなこのとおとい授かりものこそ、天から授かった特別な子どもなのです」

この詩の「両親」を「社会」に置き換えると、今の日本は子どもが生まれにくい社会なのだと言われているようである。母子保健にかかわる者の1人として、自責の念に駆られるが、子どもが健やかに育つ社会の実現のために、子どもと親に公衆衛生ができることを考えてみたい。

「育てたい」を支援する

少子化に危機感が生まれたのは平成元年の1.57ショックで、合計特殊出生率が1966年の丙午の1.58を下回った時からである。それから20年になろうとするが、少子化に歯止めはかからない。2007年に「子どもと家族を応援する日本」重点戦略検討会議が発足するなど、国はこの問題に本腰を入れて取り組んでいる。しかし、少子化対策の必要性を社会制度や経済活動の担い手の不足といった国家存亡の問題として考えなくては、子どもに在る生活を選択するか否かはあくまでも個人の価値観の問題であり、それが尊重される国民でありたい。

2005年の出生動向基本調査によると、予定子ども数が増える子ども数を下回っており、その理由の上位5つは「子育てや教育にお金がかかりすぎる」、「高齢である」、「育児の心理的・肉体的負担に耐えられない」、「自分の仕事に差し支える」、「健康上の理由から」である。つまり、わが国の少子化は価値観の問題だけではなく、社会問題、健康問題であり、そのために対策を講じる必要があるのである。この視点からわが国が抱える重要課題として、公衆衛生ができることについて5つの提言をしたい。

公衆衛生ができること—5つの提言

1. 子どもの声を聴く

昨年10月1日に東京地裁八王子支部は東京

都西東京市の「こいの森公園」から出る騒音が都の騒音規制基準値の50デシベルを超えた約60デシベルであることを理由に、騒音の差し止めを認める仮処分決定を出した。それを受けて、市は公園の噴水を止め、スケートボードを禁止した。裁判所が子どもの声を騒音であると認定したことになる。他にも全国で、運動会の練習、学校の週末の校庭開放での子どもの声、幼稚園の園児の声に対する苦情等、行政に寄せられる子どもへの声に対する苦情は少なくないという。

訴えた住民には静かな暮らしをする権利がある。しかし、子どもが生き生きと遊び、学ぶ声、他の音響と同じように音量だけで騒音と感ずる感性を悲しく思う。電車の中で泣いている乳児に対してサラリーマンが「うるさい」と声を荒げてしまう社会に、いつから日本はなったのだろうか。子どもが泣く家はうるさい、子どもの声だけでなく大人の声も大きくなる。子どもを育てるとはそういうことである。

子どもがすくすく育つ社会も子どもの声でにぎやかなはずであり、これを温かく楽しめる心の余裕と豊かさのある社会にしなければならぬ。この当たり前のことを社会が見失っているならば、それを回復するために、社会が子どもを育てることの大切さを啓蒙し、大人が社会での子育ての役割を持つことにより、子どもと触れあう機会を増やして、それを実感する方策が必要である。

2. 日本の子どもと親のために必要な根拠を作り出す

根拠に基づく医療(EBM)、根拠に基づいた健康政策が言われて久しいが、残念ながらわが国の母

山縣然太郎：1958年生まれ、山口県出身、1986年山梨医科大学卒業、臨床研修後、保健学Ⅱ講座(現社会医学講座)で教育研究に従事、1991年に文部省在外研究員として米国カリフォルニア大学アーバイン校小児科人類遺伝学教室に留学、帰国後は発癌感受性遺伝子のゲノム疫学研究、母子保健を中心とした地域保健医療政策を研究、山梨県甲州市(旧須山町)の母子保健専門研修所は20年継続している。また、ゲノム科学や生殖医療などの先端科学と社会との接点も研究テーマ、研究は住居にはじまり住民に終わるがモットー、遺伝カウンセリングはライフワーク。



子保健領域では、疫学研究の成果として得られた根拠に乏しい。育児環境が悪く、乳幼児の死亡率が高かった時代には、経験や理論で企画された事業がかなった成果を上げてきた。しかし、思春期の健康問題や虐待のように、問題が複雑化し、多様なニーズに応えなければならなくなると、科学的根拠に基づいた事業の必要性がこれまで以上に増してくる。その際に、海外でのエビデンスでは、海外と文化や価値観の異なる日本の親子に、本当に必要な支援はできない。一方で、わが国の母子保健は母子健康手帳や乳幼児健診に代表されるような、世界に誇れる支援体制を構築している。ここで得られる情報を活用することで、日本の子育てに必要な貴重な成果を得ることができるはずである。

私たちは山梨県内で20年間にわたって、妊娠届出時から乳幼児健診時に簡単な調査票を加えて、母子保健の長期縦断調査を住民や行政と一緒にやっている。他にも富士スタディーや21世紀出生児コホートなど、いくつかの母子保健の研究が進行しているが、それぞれの地域の事業で収集している情報を少し工夫するだけで、地域の子育てに必要な根拠を見出すことができる。全国の成果を集積すれば、日本全体の根拠として広く活用できる。そのためにはある程度標準化された情報収集と、それを解析するシステムが必要である。

現在、厚生科学研究助成金の研究班でシステムの構築を行っており、健やか親子21の最終評価の際には、このシステムによる指標のモニタリングの結果を活用できればと思っている。

3. 根拠を社会に説明しよう

科学的根拠を創生するための疫学研究には、人々の協力が不可欠である。また、事業をすすめるにもその必要性を説明しなければならぬ。情報を伝えるメディアは健康問題についてもその役割は大きい。報道がきっかけで特定の健康問題に世間の耳目が集まり、メディアが政府の重い腰を上げさせる重要な役割を担っている。

一方、これが個別問題の感情的報道である場合、社会全体の中で問題の重要性や優先順位を見誤らせることがある。例えば、麻疹の予防について、日本は麻疹排除に向かう第一段階の制圧期にあり、第二段階の集団発生予防期に達しているといと WHO に指摘されているが、その原因は麻疹予防接種の摂取率の低さにある。これが平成7年の予防接種法の改正による勧奨接種や、個別接種への移行が原因とすれば、それは最も重要な集団免疫よりも、当時報道が盛んに行われた予防接種による健康被害に関する社会状況の変化を重視しすぎたためかもしれない。

個々の健康被害対策と集団免疫を両立させる施策を行うには、両方の正確な情報の提供と理解を求める活動が必要である。そこで、これまでのボスターや、パンフレット、健康まつりのような啓発方法をさらに進化させて、より専門的な情報の提供と直接対話ができる「公衆衛生カフェ」や、「公衆衛生アゴラ(広場)」の開催を提案したい。

4. 対策が有効に機能する社会を取り戻そう

科学的な現状把握と根拠に基づく対策が策定されても、それが有効に機能する状況になれば、成果は上がらない。医療保険を使えない人、医療

を受けられない人の増加や、育児支援対策を実施できない企業や、育児支援を受けられない親が多いことは、制度が機能していないことを意味する。その要因が格差社会という言葉に代表される経済のみならず、教育や行政施策の不平等によるものであれば、公衆衛生はそこに目を向けなければならぬ。

社会疫学的重要性は他書に譲るとして、OECDの報告でも格差が広がった国としてワースト5に入る日本において、改めて公衆衛生の本来意義が憲法第25条の生存権にあることを思い起こす必要が出てきた。さらに、家庭の格差だけでなく、市町村の母子保健事業の格差が広がっている。例えば、資金を必要とする小児の医療費助成事業などの政策に加え、意識に依存する妊娠初期の喫煙状況を収集するような事業でも、それを収集して解析している市町村は67.4%にとどまっていることから、行政施策の格差は明らかである。日本に住む子どもたちや親が標準的な支援をどこでも受けられる体制を維持するために、都道府県、国がその実態を把握して、早急に必要な支援をしなければならぬ。

5. 先端科学を子育てに生かそう

ゲノム科学、脳科学が飛躍的に進歩し、その社会応用が広範にわたって生活を大きく変えようとしている。出生前や発症前の遺伝子検査の普及、脳イメージングなど先端の脳科学による子どもたちの社会性発達への説明と育児や教育への応用は、それを望む声が大い反響、倫理的、法的、社会的課題(ELSI: Ethical, Legal and Social Implication)を抱えている。

体外受精による出生数は2006年に19,112であり、56人に1人が体外受精による妊娠出産となった。10年間に約2.5倍に増えたとおり、生殖補助医療技術が急速に社会に定着したと言える。同時に、代理出産など第三者の関与する生殖補助医療技術の是非や、生まれてくる子どもに対する法的整備など、新たな課題を抱えている。科学の進歩は生活を豊かにするために活用したい。そのためには先端科学と社会との接点を科学し、先端科学が育児支援のために活用できるような環境整備や法整備をすることが必要であり、それも公衆衛生の重要な役割である。

5つの提言を実現するための基盤は情報と笑顔

上記のことを実現するための基盤のひとつは、情報を収集して活用できるシステムの構築である。新たな問題に迅速に対応していくために、地

域や国、世界で今何が起きているのかをリアルタイムに把握すること、個別に何が課題となっているかを知ることが不可欠である。また、情報を共有することは問題の理解を深め、対立する考え方について思いやりを持ちながら、解決に向けたチャレンجزを促進する。母子保健のモニタリングシステムについては、前述の研究班で過去数年にわたって検討して、その実行可能性についての検証を地域で行っている。加えて、システムが有効に機能している地域の経験を集積して、育児支援に必要な情報収集・活用システムのありべき姿と実行可能性を十分に検討したい。

そして、もうひとつの基盤は担当者の笑顔である。笑顔は笑顔を生み、難題を解決する力を持っている。子どもや親の笑顔があふれる社会にするには、まず、それを支援する私たちが、どんなに苦しくても、笑顔を抱やしてはいけない。

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班 長 山縣 然太朗
〒409-3898 山梨県中央市下河東 1110
山梨大学大学院医学工学総合研究部社会医学講座
TEL : 055-273-9566 FAX : 055-273-7882
E-Mail : boshidat@med.yamanashi.ac.jp

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