

Adaptation of mothers in urban area of Japan:
A follow-up study from gestation to 3 month postnatal

日本の都市部に居住する母親の適応過程
—妊娠中から産後3ヶ月までのフォローアップ研究

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平成2年4月進学

第1種博士課程

保健学専攻

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I. INTRODUCTION

Reproduction is one of the most important aspects in human adaptation and survival. The reproductive process had been mostly studied from a biological viewpoint. However, psychosocial mechanisms, also play important roles in adaptation of mothers. Recently studies of maternal health in developed countries have paid a great deal of attention to the psychosocial mechanisms (Hattori and Harada, 1988). One of such efforts was manifest in development of useful assessment systems to identify the psychologically and socially disadvantageous groups for prevention of their health problems (Davids et al., 1961; McDonald and Christiakos, 1963; Nuckolls et al., 1972; Norbeck and Anderson, 1989).

The authors of the present study detected possible effects of urbanization on adaptive process of pregnant and lactating women through a comparable study in the capital cities of 5 Asian and South Pacific countries, which culturally and ecologically differ from each other (Ohtsuka, 1991). To clarify the detailed insights of, and prospects for, the adaptive process, the present study was conducted. The research objectives and the associated methodologies were decided, taking into consideration human ecological aspects (Suzuki and Ohtsuka, 1987; Ohtsuka, 1994), in addition to psychological and sociological aspects. Repeated questionnaire survey was designed to measure maternal adaptation process. Also considered was the changing network of nurturing system unique to recent Japan, which has been revealed to have great impact on psychophysiological adaptation of pregnant and childrearing mothers (Funabashi, 1994).

The major questions, to which this study seeks to answer, are: 1) specification of the problems concerning nurturing environment, represented by parity of the newborn baby, and 2) change of maternal psychophysiological condition through prenatal and postnatal periods. The ultimate objectives are to provide informative findings useful to the maternal and child health services.

II. SUBJECTS AND METHODS

1. Subjects and procedure

The data, on which this paper is based, were collected from the repeated survey for mother-infant interactions in urban areas of Tokyo from October 1992 to October 1993; the subject mothers were recruited during their regularly scheduled clinic visits to 2 hospitals (2 public general hospitals situated in Setagaya and Inagi of Tokyo Metropolitan) at a third trimester of their gestation period. The authors obtained informed consents from them to participate in the first questionnaire survey. Then, they were requested to continuously participate in the follow-up investigations. In this study, 3 questionnaires were prepared for observations at the third trimester (Time 1), 1 month postnatal (Time 2), and 3 month postnatal (Time 3). The contents of the 3 questionnaires were basically identical but differed, in some parts, in accordance with the pregnancy-childbirth-childrearing process (Figure 1). The identical questions, which were repeatedly asked, included items about maternal adaptation, worry and fear about childbearing and childrearing, social support and life event.

The first and second questionnaire surveys were conducted in the hospital waiting rooms, whereas the last one was conducted by mail. In addition to these questionnaire surveys, medical records, particularly those of obstetric complications, were provided from the staff of the hospitals.

The average time required to complete each questionnaire was 15 minutes. The numbers of women for the 3 studies are shown in Figure 1. In Study 1 at third trimester (Time 1), 318 expectant women participated. In Study 2, which was conducted at 1 month postnatal (Time 2), 230 mothers (116 primiparae and 114 multiparae) continuously participated; of the 88 mothers who were dropped out, 87 delivered babies at other hospitals and only one had a stillborn delivery. Nineteen pairs of mother and infant were dropped out from Study 3 at 3 month postnatal because of non-response to the mailed questionnaire (Time 3). Consequently, the final subjects for Study 3 were 211 mother-infant pairs (mean age of infants = 107.2 days, SD = 17.4).

Through examination of the differences in the answers to the questionnaire at Study 1 between the 'drop-out' and 'continuous' subjects, significant difference was found only in the score of physical complaints scale (the mean score of the former was 31.6 and that of the latter was 30.0; $p < 0.05$). Thus, it was judged to exclude a possibility that worse adapted mothers only were dropped out from the study.

In the deliveries of 230 mothers observed at Study 2, perinatal problems (infant complications), i.e. gestation duration shorter than 37 weeks, and birth weight smaller than 2500 g, and occurrence of congenital abnormality, fetal distress or any treatments in Intensive

Nursing Care, were found in 25 infants. These 25 mother-infant pairs were included in the analyses (Study 2 and Study 3).

2. Measurement instruments

2-1. Measurement for psychophysiological adaptation of mothers

The measurements for psychophysiological condition of mothers have been, in general, classified into 3 categories: physical complaints, depressive mood, and anxiety. Two existing scales, the Today Health Index (THI) and the Spielberger State-Trait Anxiety Inventory (STAI), were modified for use in this study.

The THI (Suzuki, 1975; Suzuki et al., 1976) originally includes 130 items classified into 12 scales, and has demonstrated high convergent validities for estimating the tendencies towards neurosis, psychosomatic diseases (Aoki et al., 1974), schizophrenia (Suzuki et al., 1979), and depressiveness (Iwata and Saito, 1991). The most important characteristic of the THI is to quantitatively evaluate physical as well as mental health. Two scales of "depressive mood" (10 items) and "physical complaints" (20 items) were selected from the THI.

The STAI, a 40-item self-report instrument, provides separate measures for trait and state anxieties (Spielberger et al., 1970). The concurrent validity has already been examined in comparison with other well-known anxiety measures. In the present study, 20 items concerning anxiety state were used as the indicators of psychological instability during pregnancy.

In the scoring system of these questionnaire items, the higher the score the more negative the mother's adaptation.

2-2. Measurement for worry and fear concerning pregnancy, childbearing and childrearing

In this study, the authors developed measures of worry and fear (worry/fear), i.e. an 8-item measure at and before the time of childbearing (conducted at Study 1) and a 12-item measure at the time of childrearing (conducted at Study 3), both of which were designed to quantify by 4-point scales, ranging from "not at all" to "very". The 8 items of the former were: (1) diet during gestation period, (2) pain at the labor, (3) health condition of neonate, (4) sexual intercourse during perinatal period, (5) expenditure accompanied with delivery and childrearing, (6) body shape of the mother herself after delivery, (7) self-esteem of childrearing ability, and (8) work status in the postnatal life. The 8-item measure showed a good internal consistency (Cronbach coefficient $\alpha = 0.81$ for standardized variables).

The 12 items of the latter scale were: (1) infant's health, (2) infant's fussiness, (3) feeding condition of infant, (4) infant's growth, (5) maternal health, (6) mother's body shape, (7) breast feeding, (8) mother's daily time use, (9) sexual intercourse, (10) meddlesome disturbance of her parents and/or relatives in childrearing, (11) expenditure of childrearing, and (12) burden of household work. This scale also demonstrated a good internal consistency among the measures (Cronbach coefficient $\alpha = 0.71$ for standardized variables).

All of the items were selected to reflect the concrete contents of the subjects' worry and fear, which had relation with individual nurturing environment and psychophysiological conditions in comparison with anxiety scale which aimed to measure psychological instability. The higher the score of worry/fear the more negative the mother's adaptation.

2-3. Measurement for life event and social support

Each subject mother was asked to answer whether she had experienced the 9 following life events during the last 1 year (Study 1) and during the period from birth to either of the 2 research times (Study 2 and Study 3): (1) the residential move, (2) a large amount of debt, (3) neighborhood troubles, (4) separate life from her husband, (5) transference of her husband's job, (6) unemployment of her husband, (7) serious disease or wound of her families and/or relatives, (8) death of her families and/or relatives, and (9) life hazard due to environmental pollution or deteriorated security.

For measuring overall social support expectancy of mothers, the authors selected 5 tangible support items and 5 emotional support items, which the mothers expected to be provided by persons of 6 categories, i.e. husband, father, mother, father-in-law, mother-in-law, and friends. The items were "changing nappies", "bathing a baby", "amusing a baby", "preparing meals and washing dishes", and "shopping" for the former, and "taking care of her (the mother) when she is tired from childrearing", "encouraging her when she is distressed", "appraising her for childrearing", "talking with her about her worries,

fears, etc.", and "trusting her for childrearing" for the latter. Each item was assessed separately for the 6 categorized personnels, according to "certainly he/she will help", "perhaps he/she will help", "perhaps he/she will not help", and "he/she will never help". These items in the present study were internally consistent (Cronbach coefficient alpha = 0.91 at Study 1, 0.96 at Study 2, and 0.95 at Study 3 for standardized variables).

The higher the scores of social support the more optimal the mother's support network.

In Study 3, the authors asked the subject mothers about the numbers of personnels whom they received any kinds of support after childbirth; the personnels were classified into "family member (husband, parents, sister, brother)", "community member (neighbor, colleague, friend)" and "professional staff (obstetrician, pediatricist, nurse, midwife, public health nurse)".

2-4. Measurement for occurrence of obstetric complications

Medical complications of the subject mother-infant pairs during gestation, delivery or labor, and postnatal periods were asked in the questionnaire at Study 2. The assessment of these complications was made, using both the questionnaire and hospital records; there was no inconsistent case between them. The questionnaire items used in this study were derived from 2 assessment methods: an obstetrician's checklist developed by Nessbitt and Aubry (1969) and Hobel et al. (1973), which originally aimed to grasp the changeable maternal condition through the reproduction period; and, a self-report

questionnaire developed by Gertler et al. (1993), which originally aimed to stratify mothers into different risk groups.

The symptoms and contents involved in this study were grouped into 3 categories: (1) gestation complications, i.e. hypertension, edema, proteinuria and threatened premature labor; (2) labor complications, cesarean section, vaginal delivery with complication (i.e. labor prior to the 37th week, cephalopelvic disproportion, weak pains, premature rupture of the membranes, vacuum extraction, cesarean section, anomaly of the rotation, and hemorrhage) and normal vaginal delivery; (3) infant complications, i.e. infant birth weight less than 2,500 g, fetal distress, treatments in Intensive Care Nursing, and gestation duration shorter than 37 weeks.

In the statistical analyses, these complication variables were processed as dummy variables (1 for the case of absence or 2 for the case of presence).

3. Statistical methods

Nominal variables were analyzed by Pearson's Chi-square test, Fisher's exact test, or Mann-Whitney test, and continuous variables, by Student's t-test or Aspin-Welch's test.

In the analyses of the occurrence of obstetric complications, age, parity and experience of abortion were dichotomized into 2 categories, i.e. ≥ 35 years and < 35 years, primiparae and multiparae, and no experience of abortion and once or more. Logistic regression equations with socio-demographic factors as the independent variables were constructed to investigate the relative risk on the 3 categorized

complications. Odds ratios calculated from logistic regression beta coefficients were considered as the approximations of relative risk.

In order to examine the contribution of continuous variables (age, parity, maternal psychophysiological condition) to the risk of each obstetric complications, the canonical discriminant analysis was performed. The same method was also used to discover which prenatal maternal variables contributed more significantly to discrimination between the 'complicated' and 'normal' pregnancies.

In regard to the data for the maternal adaptation which were repeatedly obtained, ANOVA was used to examine the interrelatedness of effects of time course and maternal and infant conditions (from Study 1 to Study 3). The same method was used to examine the effects of nurturing environmental factors on maternal adaptation score.

The Statistical Analysis System (SAS Institute, 1982; 1990) was applied to all statistic analyses in this study.

III. RESULTS

1. Effects of nurturing environment on maternal adaptation and infant condition

General characteristics of the subject mothers and infants are shown in Table 1. Mothers were aged from 18 to 42 years, with the mean of 29 years. Almost half of them were primiparae. The proportion of mothers who had had jobs before childbearing was 35%, higher in the primiparae than in the multiparae. Eighty-seven percent of the subjects

belonged to nuclear families. One-third of the mothers stayed at their parents' house after childbirth.

In considering effects of nurturing environment on maternal adaptation, various socio-demographic factors are related. Of these, the parity is recognized as the most important factor, even though its effects have not been analyzed in detail. The highest parity of the present subjects was 3 and the proportion of the multiparae who had 2 or 3 children was as low as 10.4%; there was no subject mother who had 4 or more children. Thus, the distinction between the primiparae (50.7%) and the multiparae (49.3%) was used to evaluate effects of parity in this study.

As other nurturing environmental factors, which are considered to play decisive roles in maternal adaptation in urban areas of Japan, the authors selected 3 following conditions, i.e. family structure (nuclear or extended), the place of rearing a baby within 1 month after birth, and the number personnels from whom the subject mothers received social support. For the numbers of such personnels broken down into 3 categories between the primiparae and the multiparae, Table 2 reveals significant differences in "community member" and "professional staff". Because so large numbers of such personnels were answered by some subjects, however, the following analyses treated these 2 items as the dummy variables ("none" or "1 or more").

1-1. Effects of parity and worry/fear

The means of maternal adaptation and worry/fear variables at Time 1 (third trimester), Time 2 (1 month postnatal), and Time 3 (3 month

postnatal) were compared between the 2 parity groups, using Student's t-test and Welch's test. Statistically significant differences were found between the 2 groups in worry/fear scores both at Time 1 and Time 3 (Time 1: primiparae, mean = 17.0, SD = 3.7; multiparae, mean = 14.7, SD = 3.3, t value = 4.7, $p < 0.001$; Time 3: primiparae, mean = 20.6, SD = 4.5; multiparae, mean = 19.1, SD = 3.9, t value = 2.6, $p < 0.01$), and in depressive mood score at Time 2 (primiparae, mean = 12.1, SD = 2.7; multiparae, mean = 11.4, SD = 2.0, t value = 2.17, $p < 0.05$).

Mean scores of the primiparous and multiparous mothers for prenatal worry/fear (Time 1) are presented in Table 3 and postnatal worry/fear (Time 3) are in Table 4. Comparison between the 2 parity groups using Mann-Whitney test revealed significant differences between the primiparae and the multiparae in 'diet during gestation', 'pain at the labor', 'expenditure' and 'childrearing' at Time 1, and in 'infant's health', 'infant's growth level', and 'interference of parents or relatives' at Time 3.

Regarding the factors triggering physical complaints, depressive mood, and anxiety for either the primiparae or the multiparae, multiple regression analyses, using worry/fear and socio-demographic variables as the dependent variables, proved that the adjusted R^2 were highest in the multiparae's depressive mood score both at Time 1 (Table 5) and at Time 3 (Table 6). Multiparae's depressive mood either during gestation or 3 month postnatal was well explained by worry/fear items.

1-2. Effects of parity and other nurturing environmental factors

The analysis of variance (ANOVA), in which the effects of the parity and either of the 3 selected nurturing environment factors on each of 3 maternal adaptation variables (physical complaints, depressive mood and anxiety) at 2 postnatal research points were examined, revealed 3 significant results. As shown in Table 7, the interaction of the effects was found in the family structure (at Time 2), the place of rearing a baby within 1 month after birth (at Time 3), and receipt of community support (at Time 2) on the score of anxiety. In short, when the additive effects of other nurturing environmental factors were combined, the primiparae had the highest score and the multiparae had the lowest score in cases of extended family, receipt of community support and childrearing at parents' house.

2. Inter-factor and long-term analyses of maternal adaptation

In addition to the findings about the nurturing environment, the authors examined the effects of obstetric complications on maternal health.

2-1. Frequencies of obstetric complications

Table 8 shows proportions of mothers with each obstetric complication and the total proportion of mothers with any one of the 3 categorized complications (gestation, labor, infant).

As shown in Table 9, the regression analyses for the occurrence of gestation, labor, or infant complications, using only socio-demographic factors as the independent variables, revealed that there were 2 odds

ratios which were significantly increased and 3 odds ratios which were significantly decreased. For the former, an increase in the odds ratio was found in gestation complications for the mothers who had experienced abortion, whereas the mothers aged 35 years or over had an increased odds ratio of cesarean section. For the latter, the multiparae had an decreased odds ratio in infant complications and vaginal delivery with some kind of complications and the mothers who had experienced abortion lowered their odds ratio in infant complications. It is noted that in contrast to age, parity, and abortion experience, family type, education, prenatal work, and economic situation had lower predicting abilities for the complication occurrence.

Table 10 shows the results of discriminant analyses for the occurrence of gestation, labor, or infant complications, using age, parity, and psychophysiological factors as the independent variables. The correct classification rates were 59.7% for gestation complications, 73.3% for labor complications I (cesarean section or vaginal delivery), 60.5% for labor complications II (complicated or non-complicated vaginal delivery) and 73.3% for infant complications. No factor significantly contributed to the discrimination of the gestation complications.

Age was significant in the discrimination of the delivery method (cesarean section or vaginal delivery) and that of the occurrence of infant complications. Depressive mood contributed to the discrimination of the occurrence of labor complications in the case of vaginal delivery and that of the occurrence of infant complications. Regarding infant complications, parity and worry/fear were also detected as

significant discriminant variables. It is noted that both rates of correct classification for delivery method (labor complications I) and infant complications exceeded 70%.

2-2. Obstetric complications and maternal adaptation

To evaluate the effects of obstetric complications on maternal adaptation, the changing adaptation pattern of the individual subject mothers in 3 observation periods was finally treated.

Figures 2, 3, and 4 demonstrate the individual's records throughout 3 study times, in which the cut-off point of each of the 3 adaptation scores was set at the 75 percentile; the score over or below 75% was denoted, respectively by A or B. There were 8 categories for the changing patterns as follows: AAA, AAB, ABA, ABB, BAA, BAB, BBA, and BBB. As shown in Figure 5, BBB was most frequently observed in all of the 3 adaptation scales. The subjects included in this category were considered to be relatively well and stably adapted throughout the study period. To clarify the characteristics of the subjects involved in the 8 categories, their frequencies of obstetric complications were compared, revealing that significant χ^2 was detected only between the 2 groups with or without gestation complications in regard to depressive mood score (Chi-square = 15.1, $p < 0.05$).

To keep these notions in mind, the analysis was focused on whether the obstetric complications influenced the change of maternal adaptation expressed by the mean scores of 3 adaptation scores, physical complaints, depressive mood and anxiety, in 3 study times. The results of ANOVA are shown in Table 11. Changes of the mean scores of the subject groups with any complications (except the cases of

gestation complications and vaginal delivery for physical complaints score) was quite small throughout the 3 study times.

In regard to the differences of the adaptation scores between the groups with or without complications, the following findings were found. First, the group with infant complications had significantly higher score of depressive mood at Time 2. Second, the group with cesarean section had higher anxiety score at Time 3. In this regard, it is noted that 3 groups with cesarean section, vaginal delivery with complication and normal vaginal delivery significantly differed in anxiety score at Time 3. Third, the group with infant complications had higher anxiety score at Time 2 than that without infant complications.

The interaction effects of complications and time were not found in any pairs of variables.

IV. DISCUSSION

1. Methodological issues about adaptation indicators

Discussion should begin with the methodological issues. As in the previous studies, different kinds of questionnaires were used in this study. However, the number of measurement items were minimized to avoid undue overlap of contents and confounding effects of the items. This research framework was valid against the reported methodological drawbacks: for instance, inter-study inconsistencies of the results from the same or similar questionnaire were uninterpretable because of use of different measurement tools combined (Gallacher and Smith,

1989); measurement redundancies were not avoidable in the case of excessive use of measurement items (Monroe and Steiner, 1986).

Categorization of obstetric complications (pregnancy outcomes) has been pointed out as an important confounding factor (Istvan, 1986), despite that investigators have made efforts to set their categorization in order to find definite association between obstetric performance and prenatal psychophysiological condition (Molfese et al., 1987; Norbeck and Tilden, 1983; Nuckolls et al., 1972). In the present study, each of the 3 complications was simply dichotomized into presence or absence category. Also noted was that the authors carefully identified the obstetric complications from self-reports of the subject mothers and medical records. The present dichotomization procedure was thus judged to make it possible to apply such appropriate multivariate statistics as logistic regression and discriminant analyses.

The appropriateness of measurements selected in each analysis was assessed by the degree of dependency from each other. The inter-measurement relations represented by correlation coefficients were not extraordinarily high nor low. This indicated that the selection of the measurements in this study were judged valid. Also noted was that high Cronbach coefficient alpha values for all measurements, including those which were originally prepared in this study, ensured their validities.

2. Impacts of nurturing environment

It has been commonly recognized that psychophysiological stress is higher in primiparae than in multiparae during the period from gestation to postnatal. According to the limited number of the studies

about the effects of parity on maternal health, multiparae had more stress than primiparae (Lubin et al., 1975; Condon and Esuvaranathan, 1990) or there was no significant difference in the amount of stress between the 2 groups (Zax et al., 1975). However, there were 3 methodological drawbacks in these studies. First, all of them treated only gestational adaptation, so that the evaluation of postnatal adaptation in relation to parity was not possible. Second, there was a high possibility that the multiparae sampled were biased to include a large number of highly anxious and stressed individuals, especially in the work of Condon and Esuvaranathan (1990) whose subjects were attendants of maternal class. Third, the factors which were taken for the analysis of interaction with parity were limited; for instance, worry/fear items and urban nurturing environmental factors were not involved.

In the present study, the authors made 3 following efforts to clarify the effects of parity on maternal adaptation. First, the effects of parity were evaluated, taking into account the effect of worry/fear, which reflected the subject mother's nurturing environment and psychophysiological conditions. Primiparae had significantly higher worry/fear level in gestation and in 3 month postnatal. As illustrated in Tables 3 and 4, the primiparae suffered from unexpected burdens which derived from the psychophysiological conditions at pregnancy, childbirth and childrearing periods (Yoshinaga et al., 1993).

Second, multiple regression analyses were conducted to clarify the association among worry/fear, parity and maternal adaptation scores. Smaller adjusted R^2 in the cases of maternal adaptation scores as the dependent variables among the primiparae than the multiparae indicated that the multiparae's scores of worry/fear reflected well their

adaptation scores, especially depressive mood score. In other words, the higher worry/fear the lower in adaptation among the multiparae.

Third, other factors relating nurturing environment, i.e. family structure, childrearing at parents' house and social support resource in community member, were treated in the analyses of maternal adaptation in relation to parity. It was demonstrated that primiparae's need of social support was greater than multiparae's. For primiparae, the larger amount of social support they received the higher their anxious level at postnatal period. For instance, as presented in Table 7, the primiparae who received abundant social support, lived in extended families, stayed at parent's house during the period within 1 month postnatal, and/or received support from community members, tended to have high level of anxiety. In conjunction with the results of significant different items of worry/fear and the findings concerning social support, the authors concluded that the primiparae were so anxious about their childbirth and childrearing that social support was markedly needed. In contrast, higher worry level and smaller support of the multiparae lowered their adaptation. This phenomenon accords with a hypothetical opinion that social support can be regarded as a buffer to reduce anxiety level of adaptation of multiparae from gestation to 3 month postnatal (Cutrona, 1984; Cohen and Wills, 1985; Hisata, 1992). The authors judged that this situation is characteristic to the urban-dwelling multiparous mothers in Japan, because they have to take the bulk of the responsibilities of childrearing, even if they receive husband's cooperation.

These findings lead to suggestions to improve the current maternal care in Japan. There are 2 drawbacks. First, maternal education has been conducted mostly for primiparous expectant mothers. Second, the

education programs have been designed to provide the same or similar information to any mothers, irrespective of their individual variations. The authors propose that maternal education should include multiparae and that the detailed programs should be prepared, taking into account individual variations, particularly in the worry and fear and nurturing environment.

3. Determinants of obstetric complications in reproduction process and their impacts

In this study, the determinants of 3 kinds of obstetric complications, i.e. gestation complications, labor complications and infant complications, were analyzed according to 2 different settings. The first was logistic regression analyses, using socio-demographic factors as the dependent variables; the second was discriminant analyses, using maternal adaptation and worry/fear factors together with age and parity as the dependent variables.

Discussion begins with the results of the former. The occurrence of obstetric complications was more affected by demographic variables (age and parity) than socio-economic variables (education, family type, prenatal work status, economic situation). Significant effect of age on the increase of risk of cesarean section accorded with previous findings that Singaporean women who gave birth at the National University Hospital, Singapore and aged 35 years or over frequently required instrumental interventions for delivery process (Viegas et al., 1994). Nonsignificant influence of prenatal socio-economic factors on perinatal problems is judged to have reflected the characteristic of

the subject mothers that only 3.8% of them felt unsatisfied for their economic situation; this situation contrasted with other populations, like a minority group in the United States, involving a large number of poor mothers, among whom socio-economic factors were related to perinatal problems (Norbeck and Anderson, 1989; Collins and Shay, 1994).

In the latter, in which demographic and psychophysiological factors were used as the dependent variables for discriminant analyses, there were 2 major following observations.

First, worry/fear score played more predictable roles in the occurrence of infant complications than anxiety score did. This result is inconsistent with the findings of several studies (Davids et al., 1961; Zuckerman et al., 1963; McDonald and Christiakos, 1963), in which gestation anxiety had significant effects on the occurrence of obstetric complications, though they did not examine the effects of worry/fear. Taking into account that the worry/fear scales using concrete questionnaire items in this study were designed to reflect both physiological and psychological situations (Yoshinaga et al., 1994), more significant effect of worry/fear is judged reasonable. This judgment is supported by other studies, even if indirectly: Standley et al. (1979) asserted that anxiety was not a unitary structure; Carlson and Labarba (1979) and Chalmers (1983) suggested that psychological and emotional predictors was not the sole factor to enhance susceptibility of obstetric complications.

Second, worry/fear and depressive mood, in conjunction with age and parity, are judged to be sensitive indicators for predicting infant complications. Significant effects of prenatal depressive mood on the

occurrence of labor complications at vaginal delivery were also observed. It is judged that the prodromata of these complications appeared during gestation. There are possibilities that some subjects had specific physical conditions, like the problems in parturient canal, and increased their feeling of suppression to be depressed. Consequently, both measures were interrelated, though the present studies did not collect information about the mother's condition corresponding to the prodromata of obstetric complications. The previous studies of treating maternal prenatal and postnatal conditions used a limited number of personality or psychological factors and no physiological factor (Gjeringen et al., 1991; Schaefer et al., 1987). The present study succeeded, if not fully, in examining the association between psychological factors and physiological factors, to overcome difficulties that of grasping accurate condition of mothers in usual prenatal clinical examinations (Forde et al., 1992; Forde and Malterud, 1992; Forde, 1993). Thus, it can be suggested that prenatal health examinations should pay more attention to preliminary detect the linkage of psychological and physiological factors.

4. Maternal adaptation process from gestation to 3 month postnatal

To elucidate psychophysiological adaptation process through reproduction period, it is important to examine whether there is any symptoms relating to changes of psychiatric mood (Hopkins et al., 1984; Cutrona, 1982): one of such symptoms is maternity blues which is characterized by tearfulness, prompt occurrence within a few days after childbirth and almost complete recovery within a short term; the second is postpartum depression with mild and moderate depression symptoms,

which appears during 1 to 6 month; the third is postpartum psychosis, including acute symptoms like delusion, delirium or confusion. As the background of these mood changes, there have been noted that endocrinological changes representative of acute increase or decrease of sex hormones or steroid hormones in plasma (Harris, 1994) and/or socio-psychological change representative of the transition to the parenthood (Belsky, 1988) occur just after childbirth. Clinically, the bulk of infants from postpartum women who suffer from these mood changes have retardation in development in some cases. However, few quantitative researches have been conducted to reveal postnatal adjustment of normal mothers.

In this concern, the results of change of maternal adaptation are discussed. From the complicated individual patterns in change of the adaptation scores, the authors found that the subjects had experiences adaptation score higher than 75 percentile from the mean at either of the 3 study times. These individual differences were explained to a large extent when the subjects were broken down according to the presence or absence of obstetric complications. The psychophysiological conditions of the group with obstetric complications tended to be highly stressed throughout the study period, whereas that of the group without obstetric complications fluctuated. Regarding labor complications and infant complications in particular, the group with such complications kept high scores, contrasting to the patterns that the mean depressive score of the group without complications were strikingly low at 1 month postnatal and that the mean anxiety scores at 1 month postnatal and 3 month postnatal were markedly lower than that at gestation. Thus, the authors can conclude that a mother who

experiences any type of obstetric complications is difficult to adapt to the new condition at least at 3 month postnatal, because new burdens of childrearing tend to increase.

V. CONCLUSION

One of the most important implications of this study is that a brief questionnaire used is effective in identification of psychophysiological conditions of mothers, which play central roles in maternal adaptation process. The principal findings are summarized as follows.

1. The authors revealed that maternal adaptation process was markedly affected by the parity of newborn babies. Primiparae had more social support than multiparae and this difference was judged to relate to large amount of worry/fear among the former group. Among multiparae, poor psychophysiological conditions were mostly attributable to high level of worry and fear and to small amount of social support received.
2. The discriminant analyses, which involved items of maternal psychophysiological conditions in addition to age and parity, resulted in sufficient rates of correct classification to discriminate mothers into 2 groups according to the presence or absence of cesarean section and of infant complications.
3. In the group with obstetric complications, maternal psychophysiological conditions were highly stressed without marked fluctuations. From comparison with lowered adaptation scores of the group without complications at 1 month or 3 month postnatal, it is

judged that the recovery of the former group's adaptation tended to delay.

Based on these findings, the authors propose 3 suggestions to maternal health services.

1. Maternal education programs in Japan, which have exclusively targeted primiparae, should be expanded to multiparae, taking into account individual difference in psychophysiological situations such as worry and fear and social support.

2. Careful prenatal examination for mother's psychophysiological conditions is effective to the preventive treatments of obstetric complications; the questionnaire used in this study is one of the appropriate tools.

3. The follow-up care of psychophysiological conditions for mothers with obstetric complications should be extended at least until 3 month postnatal, in addition to the care for infants.

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Table 1. General characteristics of mothers and infants (N=211)

Characteristic		Characteristic	
Age		Economic situation (%)	
Mean	29.0	Very satisfied	9(4.3)
SD	4.8	Satisfied	135(64.0)
Range	18-42	Less satisfied	53(25.1)
35 and over(%)	29(13.7)	Unsatisfied	8(3.8)
34 and less(%)	182(86.3)	Unknown	6(2.8)
Parity(%)		Education duration(%)	
0	107(50.7)	Less than 12 years	91(43.1)
1	82(38.9)	13 years or over	119(56.4)
2	18(8.5)	Unknown	1(0.5)
3	4(1.9)	Childrearing at parent's house(%)	
Mean	0.6	No	141(66.8)
SD	0.7	Yes	67(31.8)
Abortion(%)		Unknown	3(1.4)
None	148(70.1)	Family type(%)	
Once or more	63(29.9)	Nuclear family	183(86.7)
Unknown	0(0.0)	Extended family	28(13.3)
Infant's sex		Prenatal work status(%)	
Male	104	Unemployed	134(63.5)
Female	107	Employed	74(35.1%)
Birth weight (g)		Unknown	3(1.4)
Mean	3123.2	Postnatal work status(%)	
SD	403.4	Full-timer	13(6.2)
Gestation week		Intend full-timer	23(10.9)
Mean	39.3	Part-timer	7(3.3)
SD	1.4	Intend part-time	27(12.8)
		No work	141(66.8)

Table 2. Means of the numbers of personnels in family, community and professional resource of social support

Social support resources	Primiparous	Multiparous	Number	T Value	Significance
Family member	4.1 (1.7)	4.3 (2.0)	P=106 M=99	1.4	NS
Community member	4.8 (5.3)	3.6 (3.9)	P=106 M=99	1.8	p<0.01
Professional staff	2.9 (4.5)	2.1 (3.5)	P=106 M=99	1.6	p<0.05
Self-esteem	3.4 (3.3)	3.4 (3.3)	P=106 M=99	-0.1	NS
Self-efficacy	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
General locus of control	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
Internal locus of control	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
Extrinsic locus of control	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
Body image	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
Childbearing	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS
Practical work	3.3 (3.3)	3.3 (3.3)	P=106 M=99	-0.1	NS

Table 3. Differences of prenatal worry/fear between primiparae (P) and multiparae (M)

Item##	Mean	(SD)	Sum of scores	Expected	Std deviation	Z	Significansce#
Diet							
(P)	2.1	(0.6)	9510.5	10920.0	367.0	-3.8	p<0.001
(M)	1.8	(0.6)	12434.5	11025.0	367.0		
Pain							
(P)	2.6	(0.9)	9023.5	10920.0	401.3	-4.7	p<0.001
(M)	2.0	(0.8)	12921.5	11025.0	401.3		
Infant's health							
(P)	2.9	(1.0)	10489.0	10920.0	408.6	-1.1	NS
(M)	2.8	(0.9)	11456.0	11025.0	408.6		
Sexual intercourse							
(P)	1.5	(0.7)	10407.0	10920.0	379.0	-1.4	NS
(M)	1.4	(0.6)	11538.0	1102530.0	379.0		
Expenditure							
(P)	1.7	(0.7)	9796.0	10920.0	392.3	-2.9	p<0.01
(M)	1.5	(0.7)	12149.0	1102530.0	392.3		
Body shape							
(P)	2.3	(0.9)	10594.0	10920.0	412.1	-0.8	NS
(M)	2.2	(1.0)	11351.0	11025.0	412.1		
Childrearing							
(P)	2.4	(1.0)	8689.5	10920.0	404.1	-5.5	p<0.001
(M)	1.7	(0.6)	13255.5	11025.0	404.1		
Postnatal work							
(P)	1.4	(0.7)	10428.5	10920.0	355.5	-1.4	NS
(M)	1.3	(0.7)	11516.5	11025.0	355.5		

Wilcoxon 2-sample test (normal approximation) with continuity correction 0.5.

Quantification by 4-point scale: "very concerned", "quite concerned",

"a little concerned", and "not at all concerned".

Table 4. Differences of postnatal worry/fear between primiparae (P) and multiparae (M)

Item##	Mean	(SD)	Sum of scores	Expected	Std deviation	Z	Significance#
Infant's health							
(p)	1.7	(0.8)	9935.0	11024.0	391.9	-2.8	p<0.01
(M)	1.4	(0.5)	12431.0	11342.0	391.9		
Infant's fussiness							
(p)	1.3	(0.5)	10396.0	11024.0	330.1	-1.9	NS
(M)	1.2	(0.5)	11970.0	11342.0	330.1		
Feed condition							
(p)	1.6	(0.8)	10418.5	11024.0	388.1	-1.6	NS
(M)	1.5	(0.7)	11947.5	11342.0	388.1		
Infant's growth level							
(p)	1.7	(0.7)	10076.0	11024.0	395.9	-2.4	p<0.05
(M)	1.5	(0.6)	12290.0	11342.0	395.9		
Maternal health							
(p)	1.6	(0.6)	10673.5	11024.0	391.2	-0.9	NS
(M)	1.5	(0.6)	11692.5	11342.0	391.2		
Body shape							
(p)	2.4	(1.0)	11081.0	11024.0	413.8	0.1	NS
(M)	2.4	(0.9)	11285.0	11342.0	413.8		
Breastfeeding							
(p)	1.7	(1.1)	11005.5	11024.0	406.2	0.0	NS
(M)	1.6	(0.8)	11360.5	11342.0	406.2		
Mother's time use							
(p)	1.8	(0.7)	10938.5	11024.0	402.0	-0.2	NS
(M)	1.8	(0.8)	11427.5	11342.0	402.0		
Sexual intercourse							
(P)	1.5	(0.6)	10462.0	11024.0	382.9	-1.5	NS
(M)	1.5	(0.8)	11904.0	11342.0	382.9		
Disturbance							
(P)	1.5	(0.8)	9794.0	11024.0	351.0	-3.5	p<0.001
(M)	1.2	(0.5)	12572.0	11342.0	352.0		
Expenditure							
(P)	1.9	(0.8)	10368.0	11024.0	408.1	-1.6	NS
(M)	1.7	(0.8)	11998.0	11342.0	408.1		
Household work							
(P)	1.8	(0.8)	10698.0	11024.0	404.3	-0.8	NS
(M)	1.8	(0.7)	11668.0	11342.0	404.3		

Wilcoxon 2-sample test (normal approximation) with continuity correction 0.5.

Quantification by 4-point scale: "very concerned", "quite concerned", "a little concerned", and "not at all concerned".

Table 5. Results of multiple regression analyses of prenatal adaptation (Time 1) with worry/fear predictors

Variable	Physical complains		Depressive mood		Anxiety	
	Beta #					
	(P) ##	(M)	(P)	(M)	(P)	(M)
Socio-demographic						
Age	-0.1	0.0	-0.2	0.2 *	-0.1	0.1
Abortion	-0.1	0.1	0.1	0.1	0.1	0.1
Family type	0.0	0.1	0.1	0.0	0.1	0.1
Education	-0.1	0.1	0.0	0.0	-0.2	-0.1
Economic situation	0.0	0.0	-0.1	0.0	-0.1	0.0
Prenatal work	-0.3 **	-0.2	-0.1	-0.3 ***	-0.1	-0.1
Worry/fear						
Diet	0.1	0.1	0.1	0.0	0.1	-0.1
Pains	-0.1	0.2	0.1	0.1	0.1	0.2
Infant	0.1	0.1	0.0	-0.1	0.0	0.0
Sexual intercourse	0.1	0.0	0.0	0.2	-0.1	0.1
Expenditure	0.1	0.2	-0.1	0.3 **	0.0	0.2
Body shape	-0.1	-0.1	0.1	0.0	-0.1	-0.1
Childrearing	0.0	0.0	0.2	0.2 **	0.2	0.3 **
Postnatal work status	0.2	0.2 *	0.1	0.3 **	-0.1	0.2
Total R-square	0.2	0.3	0.2	0.5	0.2	0.3
Adjusted R-square	0.1	0.1	0.0	0.4	0.0	0.2
F-value	1.9	2.2	1.2	4.4	1.2	2.8
P for F-value	*	*	NS	***	NS	**

Beta indicates standardized regression coefficient.

(P): primiparae, (M): multiparae.

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Table 6. Results of multiple regression analyses of postnatal adaptation (Time 3) with worry/fear predictors

Variable	Physical complains		Depressive mood		Anxiety	
	Beta #					
	(P) ##	(M)	(P)	(M)	(P)	(M)
Socio-demographic						
Age	0.1	-0.1	0.0	0.0	0.1	0.1
Abortion	0.0	0.0	0.0	0.0	0.0	0.1
Family type	-0.1	-0.1	0.1	-0.1	0.1	0.0
Education	-0.2 *	-0.2	-0.1	-0.2 *	-0.1	0.0
Economic situation	0.0	0.0	0.0	0.0	0.0	0.0
Prenatal work	0.1	0.1	-0.2	0.0	-0.1	-0.1
Worry/fear						
Infant's health	0.1	0.3 **	0.1	0.2 *	0.3 **	0.1
Fussiness	-0.1	-0.1	0.0	0.2 *	0.1	0.2
Feed	0.1	0.0	0.1	0.1	0.1	0.1
Growth	-0.1	-0.1	-0.2	-0.3 *	-0.2	0.0
Maternal health	0.5 ***	0.3 **	0.1	0.2	0.1	0.2
Body shape	-0.1	0.1	-0.1	0.0	0.0	-0.1
Breast feed	0.1	0.0	0.0	0.0	0.0	-0.1
Time	0.0	0.1	0.0	0.0	0.0	0.1
Sexual intercourse	0.1	0.0	0.0	0.2 *	0.0	0.2
Disturbance	0.1	0.2	0.1	0.0	0.1	-0.1
Expenditure	0.0	-0.1	0.1	0.1	0.1	0.1
Household	-0.2	0.2	0.2	0.1	0.1	0.1
Total R-square	0.3	0.4	0.2	0.4	0.3	0.3
Adjusted R-square	0.2	0.2	0.0	0.2	0.2	0.2
F-value	2.3	2.6	1.1	2.6	2.3	2.0
P for F-value	**	**	NS	**	**	*

Beta indicates standardized regression coefficient.

(P): primiparae, (M): multiparae.

* p<0.05 ** p<0.01 *** p<0.001.

Table 7. Analyses of variance of anxiety score by parity and social support factors

Source	DF	Type I SS	Mean square	F value	Significance
Anxiety (T2)					
Parity	1	99.0	99.0	1.9	NS
Family type	1	4.4	4.4	0.1	NS
Parity*family	1	230.4	230.4	4.4	p<0.05
Anxiety (T2)					
Parity	1	99.0	99.0	1.9	NS
Community member's support	1	3.1	3.1	0.1	NS
Parity*community support	1	394.5	394.5	7.6	p<0.01
Anxiety (T3)					
Parity	1	15.5	15.5	0.2	NS
Stay at parent's house	1	1.5	1.5	0.0	NS
Parity*stay at parent's	1	421.8	421.8	5.8	p<0.05
Anxiety (T2)	Mean	(SD)	N		
Primiparae x core	37.3	(7.9)	90		
x extend	40.4	(7.8)	16		
Multiparae x core	36.7	(6.8)	87		
x extend	33.7	(4.4)	12		
Anxiety (T2)					
Primiparae x no support	33.2	(8.3)	12		
x community support	38.4	(7.7)	94		
Multiparae x no support	38.2	(6.7)	25		
x community support	35.8	(6.5)	74		
Anxiety (T3)					
Primiparae x no stay	35.7	(8.6)	63		
x stay	38.1	(8.7)	43		
Multiparae x no stay	37.1	(8.7)	74		
x stay	33.0	(7.2)	22		

Table 8. Frequencies and categorization of obstetric complications

	No. of cases(%)		No. of cases(%)		No. of cases(%)
A. Gestation complications		B. Labor complications		C. Infant complications	
Hypertension	10(4.3)	Labor prior to 37th week	8(3.5)	Birth weight (<2500g)	11(4.8)
Edema	42(18.3)	CPD	5(2.2)	Fetal distress	11(4.8)
Proteinuria	25(10.9)	Weak pain	37(16.1)	ICN	1(0.4)
Threatened premature labor	45(19.6)	Ruptured membranes	25(10.9)	Gestation duration shorter than 37 weeks	8(3.5)
		Breech presentation	9(3.9)	Congenital abnormality	7(3.3)
		Vacuum	34(14.8)		
		Cesarean section	32(13.9)		
		Anomaly of rotation	6(2.6)		
		Hemorrhage	25(10.9)		
Categorization		Categorization		Categorization	
With complication	84(39.8)	I		With complication	25(11.8)
Without complication	127(60.2)	Cesarean section	29(13.7)	Without complication	186(88.2)
		Vaginal	182(86.3)		
		II			
		Cesarean section	29(13.7)		
		Vaginal with complication	81(38.4)		
		Vaginal without complication	101(47.9)		

Table 9. Results of logistic regression analyses for the obstetric complications with socio-demographic predictors

Gestation complications						Labor complications (I)#1					
	Beta	Error	Odds	Min	Max		Beta	Error	Odds	Min	Max
Age	0.4	0.4	1.4	0.6	3.4	Age	1.5	0.5	4.4	1.6	12.3 **
Abortion	0.9	0.3	2.4	1.3	4.4 **	Abortion	-0.7	0.5	0.5	0.2	1.4
Parity	-0.4	0.3	0.7	0.4	1.2	Parity	-0.2	0.5	0.8	0.3	1.9
Prenatal work	-0.1	0.3	0.9	0.5	1.7	Prenatal work	-0.3	0.5	0.7	0.3	1.8
Economic situation	-0.1	0.3	0.9	0.5	1.7	Economic situation	-0.2	0.5	0.8	0.3	2.0
Family type	-0.8	0.4	0.4	0.2	1.0	Family type	0.8	0.5	2.2	0.8	6.0
Education	-0.2	0.3	0.8	0.5	1.5	Education	-0.2	0.4	0.8	0.3	1.8

Infant complications						Labor complications (II)#2					
	Beta	Error	Odds	Min	Max		Beta	Error	Odds	Min	Max
Age	0.8	0.7	2.1	0.6	7.8	Age	0.8	0.5	2.2	0.8	6.1
Abortion	-1.6	0.8	0.2	0.0	0.9 *	Abortion	-0.1	0.3	0.9	0.5	1.7
Parity	-1.0	0.5	0.4	0.1	1.0 *	Parity	-0.7	0.3	0.5	0.3	1.0 *
Prenatal work	-0.7	0.5	0.5	0.2	1.4	Prenatal work	-0.2	0.3	0.9	0.5	1.6
Economic situation	-0.7	0.6	0.5	0.2	1.4	Economic situation	0.3	0.3	1.3	0.7	2.6
Family type	-0.3	0.7	0.7	0.2	2.8	Family type	0.1	0.5	1.2	0.4	2.9
Education	-0.7	0.5	0.5	0.2	1.3	Education	0.1	0.3	1.1	0.6	2.0

All the dependent variables and the independent variables were used as dummy variables (1-2).

The dependent variables were coded as follows: Age group: 1 = younger than 35, 2 = 35 or over, Abortion: 1 = no experience, 2 = any experience, Parity: 1 = primiparous, 2 = multiparous, Prenatal work: 1 = unemployed, 2 = employed, Economic situation: 1 = satisfied with their economic situation, 2 = unsatisfied with their economic situation, Family type: 1 = core, 2 = extend, Education: 1 = high school or less, 2 = more.

The odds ratios mean that the focusing groups (coded 2 in independent variables) have the greater (or smaller) risks of the occurrence of each complication (coded 1 in dependent variables) than the control groups (coded 1 in independent variables).

#1 Cesarean section was coded 1 and vaginal delivery was coded 2.

#2 Vaginal delivery with one of complications was coded 1 and that without any complication was coded 2.

* $p < 0.05$, ** $p < 0.01$.

Table 10. Results of discriminant analyses for the occurrence of obstetric complications

Variable	Gestation			Labor(I)##			Labor(II)##			Infant		
	Coef.#	F	P	Coef.	F	P	Coef.	F	P	Coef.	F	P
Age	-0.1	0.1		1.1	14.7	***	0.6	0.6		0.9	5.2	*
Parity	-0.3	0.1		-0.3	0.1		-0.6	1.1		-0.7	4.2	*
Worry/fear	-0.6	0.1		0.5	2.9		0.3	2.6		0.3	4.8	*
Complaints	0.8	3.5		0.0	0.3		0.3	1.8		0.2	3.0	
Depressive	0.3	1.4		-0.2	0.2		0.5	4.2	*	0.2	4.9	*
Anxiety	0.3	1.8		0.3	1.6		0.0	1.1		0.2	3.2	
Likelihood ratio		1.0			0.9			1.0			0.9	
Approx F		1.0			4.4			1.5			4.4	
Significance for F		NS			***			NS			***	
Correct classification		59.7%			73.3%			60.5%			73.3%	

"Coef.": standardized canonical coefficient.

Labor (I): Cesarean section or vaginal delivery. Labor (II): Vaginal delivery complicated or non-complicated.

* p<0.05 ** p<0.01 *** p<0.001

Table 11. Change of maternal adaptation (mean and SD)

	Complaints						Depressive mood						Anxiety					
	Time 1 Mean	SD	Time 2	Time 3	P		Time 1 Mean	SD	Time 2	Time 3	P		Time 1 Mean	SD	Time 2	Time 3	P	
<u>Gestation complications</u>																		
With	30.6	4.5	28.0	4.1	30.3	5.3 ***	12.6	2.8	11.9	2.5	12.8	3.0 NS	38.8	7.7	37.9	7.3	37.7	8.3 NS
(N)	84		85		85		84		85		85		84		85		85	
Without	29.2	5.5	27.4	4.7	29.3	5.8 **	12.1	2.6	11.6	2.3	12.5	2.8 *	37.3	8.0	36.7	7.2	35.8	9.0 NS
(N)	126		124		126		126		124		126		124		126		125	
T	-1.9		-1.0		-1.3		-1.2		-0.9		-0.6		-1.3		-1.3		-1.5	
P	NS		NS		NS		NS		NS		NS		NS		NS		NS	
<u>Labor complications (I)</u>																		
Cesarean	30.3	5.3	27.8	4.1	29.1	5.0 NS	12.5	2.6	12.9	3.6	13.1	2.6 NS	39.7	5.6	39.6	8.2	39.8	10.4 NS
(N)	29		28		29		29		28		29		29		29		29	
Vaginal	29.7	5.2	27.6	4.5	29.8	5.7 ***	12.3	2.7	11.6	2.1	12.6	2.9 ***	37.6	8.2	36.7	7.1	36.1	8.4 NS
(N)	181		181		182		181		181		182		179		182		181	
T	-0.6		-0.2		0.7		-0.5		-1.9		-1.0		-1.7		-1.9		-2.1	
P	NS		NS		NS		NS		NS		NS		NS		NS		*	
<u>Labor complications (II)</u>																		
Cesarean	30.3	5.3	27.8	4.2	29.1	5.0 NS	12.5	2.6	12.9	3.6	13.1	2.6 NS	39.7	5.6	39.6	8.2	39.8	10.4 NS
(N)	29		29		29		29		29		29		29		29		29	
Vaginal(1)	30.2	5.7	28.0	4.8	30.1	5.5 *	12.7	3.2	12.0	2.5	13.1	3.3 NS	38.3	8.3	37.8	7.3	37.4	8.7 NS
(N)	80		80		81		80		80		81		80		81		81	
Vaginal(2)	29.3	4.7	27.3	4.3	29.6	5.9 **	11.9	2.2	11.2	1.7	12.2	2.5 **	37.1	8.0	35.9	6.8	35.0	8.0 NS
(N)	101		101		101		101		101		101		101		101		101	
F	0.5		0.3		0.7		2.0		0.8		1.9		1.2		1.3		3.1	
P	NS		NS		NS		NS		NS		NS		NS		NS		*	
<u>Infant complications</u>																		
With	31.5	6.8	28.2	4.9	29.0	5.4 NS	13.5	4.4	13.3	1.0	13.7	4.1 NS	40.7	9.5	39.8	8.4	39.4	9.4 NS
(N)	24		25		25		24		25		25		24		25		25	
Without	29.6	4.9	27.6	4.4	29.8	5.6 ***	12.2	2.4	11.5	2.0	12.5	2.7 ***	37.5	7.6	36.8	7.0	36.2	8.6 NS
(N)	186		184		186		186		184		186		184		186		185	
T	-1.4		-0.7		0.7		-1.4		-2.1		-1.4		-1.8		-2.0		-1.7	
P	NS		NS		NS		NS		*		NS		NS		*		NS	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Vaginal(1) includes labor prior to 37th week, CPD, weak pain, ruptured membranes, breech presentation, vacuum, anomaly of rotation and hemorrhage.

Vaginal(2) means normal vaginal delivery.

Study No. and subjects	Reproduction process	Basic information	Assessment time and assessment items
Study 1 318 expectant mothers	Third trimester (prenatal)	Socio-demographic factors (age, parity, family, etc.)	Time 1 psychophysiological condition Physical complaints Depressive mood Anxiety Social support Life event Worry/fear
Study 2 230 mothers with 1 month old infants	Perinatal	Obstetric complications (gestation, labor, infant)	
	1 month postnatal (postpartum)	Childrearing place	Time 2 psychophysiological condition Physical complaints Depressive mood Anxiety Social support Life event
Study 3 211 mothers with 3 month old infants	3 month postnatal (postpartum)	Mother's postpartum intention to have a job	Time 3 psychophysiological condition Physical complaints Depressive mood Anxiety Social support Numbers of personnels of social support resorces Life event Worry/fear

Figure 1. Research framework.

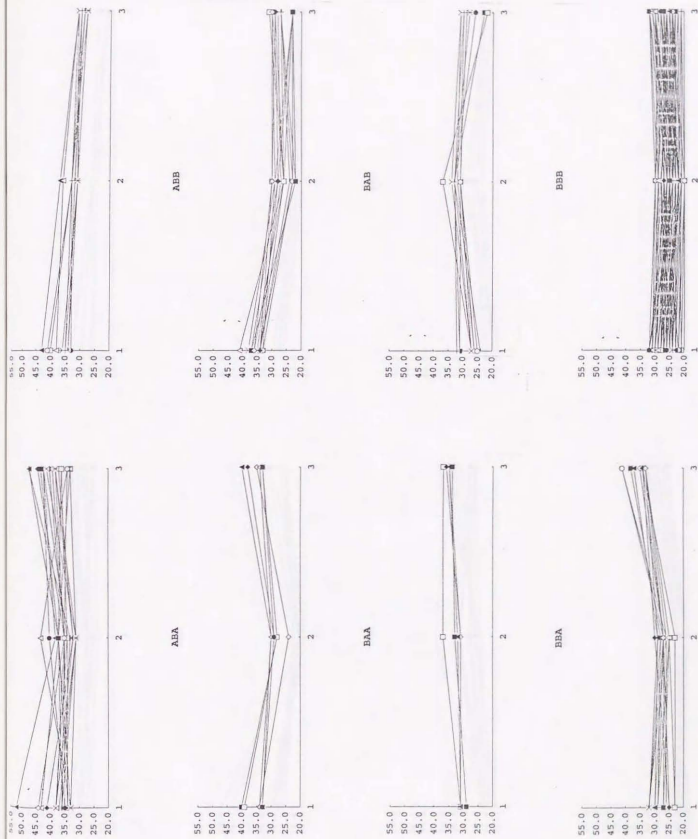


Figure 2. Change of mean score of physical complaints from prenatal (1) to 3 month postnatal (3).

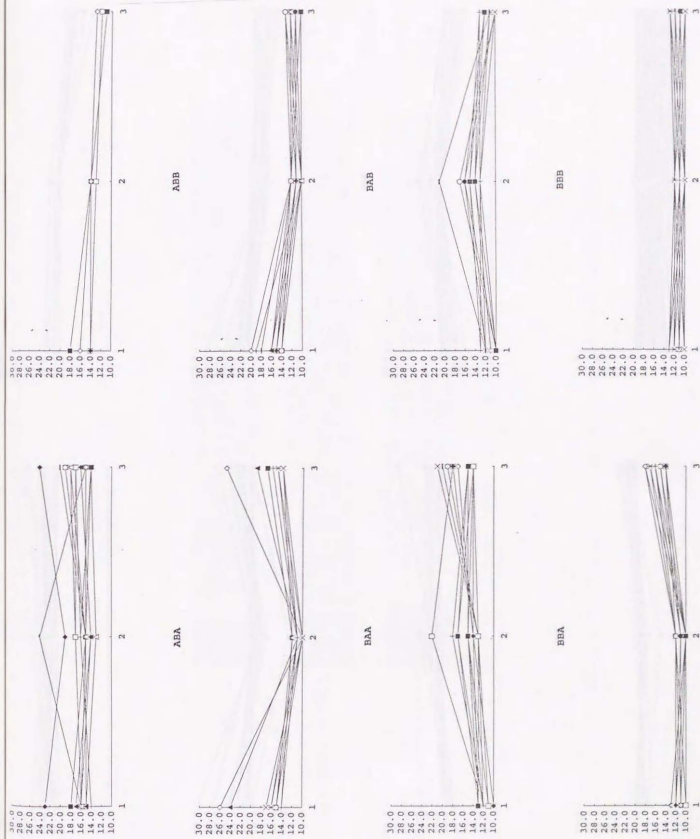


Figure 3. Change of mean score of depressive mood from Prenatal (1) to 3 month postnatal (3).

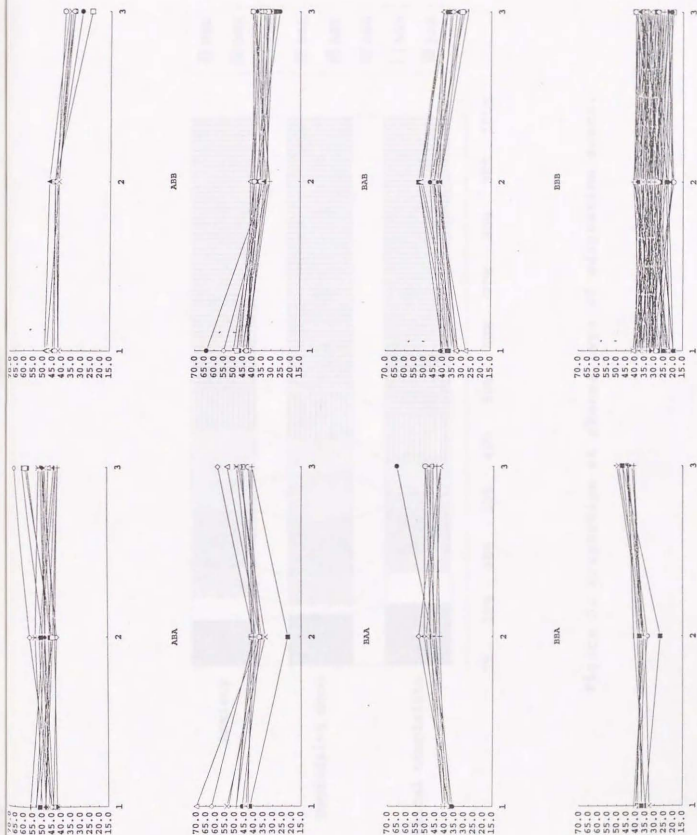


Figure 4. Change of mean score of anxiety from prenatal (1) to 3 month postnatal (3).

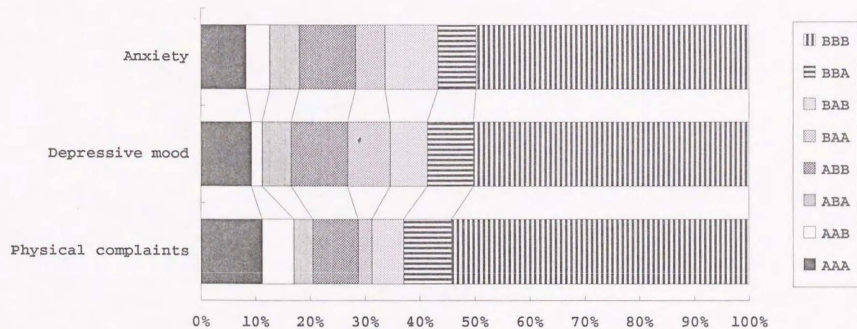


Figure 5. Proportion of change type of adaptation score.

