

Developing a Prenatal Couple Education Program Focusing on Coparenting for Japanese Couples: A Quasi-Experimental Study

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Having and raising children can be a source of joy for parents. However, the transition to parenthood is associated with a certain degree of strain and stress, and couple relationship quality often declines during the transition. Coparenting, the shared responsibility of childrearing, benefits both parents and children and is an important aspect of the transition to parenthood. In this quasi-experimental study, we aimed to develop a couple education program in Japan that focuses on coparenting among couples expecting their first child. Twenty-one healthy couples voluntarily participated in the intervention group ($n = 16$) or the control group ($n = 5$). Couples in each group could voluntarily participate in standard childbirth education classes. The intervention was a couple education program designed to enhance coparenting and consisted of two interactive classes, including discussions within each couple and watching a short video showing an example of childrearing. We collected outcome measures on childrearing, couple relationship, parental mental health, and child adjustment at 1 month and 3 months after childbirth. Multiple regression analysis was performed and showed positive effects of the intervention on childrearing and child adjustment. Being in the intervention group had a significant positive effect on Coparenting Support scores at 1 month after childbirth ($\beta = 0.457$, $p < 0.003$, $R^2 = 0.187$) and Soothability scores for child adjustment at 3 months after childbirth ($\beta = 0.429$, $p < 0.006$, $R^2 = 0.157$). In conclusion, we have developed the prenatal education program focusing on coparenting for Japanese couples.

Keywords: childcare; childrearing; co-parenting; parenting; pregnancy

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Introduction

Although having and raising children can be a source of joy for parents, the transition to parenthood comes with strain and stress (Galinsky 1987; Cowan and Cowan 1988). Couple relationship quality often declines during the transition, and couples experience more conflict and distress (Slep and O'Leary 2005; Onodera 2005; Lawrence et al. 2008; Doss et al. 2009). In addition, parents have reported high levels of anxiety and stress after having their first child, which subsequently results in increased rates of depression (Perren et al. 2005; Vismara et al. 2016). Furthermore, the rate of single mothers due to divorce between the birth of their first child to the child reaching the age of five was over 75% (Ministry of Health, Labour and Welfare 2016). The highest rate of abused children who died was 65.3% and occurred in a child less than a year old (Ministry of Health, Labour and Welfare 2018). New parents suffer from psychological and physical vulner-

ability and challenges in adapting to parenthood. In the transition to parenthood, it is important to share responsibility for parenting duties. In other words, "coparenting" will help mothers and fathers as well as their children.

Previous research has reported the potential impact of enhanced coparenting. For instance, increased coparenting in a relationship seems to improve overall marriage quality. (Holland and McElwain 2013). Particularly, Feinberg et al. (2009) found that couples experienced less negative communication and more warmth between partners after a coparenting enhancement intervention. Coparenting also reduced maternal anxiety and stress related to childcare (Feinberg and Kan 2008; Feinberg et al. 2016). After these interventions, postpartum depression symptoms also decreased for both mothers and fathers (Feinberg et al. 2016). A high level of parenting quality, manifested as parents caring for their children with warmth, attention, and responsiveness, was also associated with increased coparenting, and subsequently associated with infants' adjust-

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ment (Feinberg 2002; Feinberg 2003; Belsky 1984). Evidence has also indicated that when coparenting is enhanced during the transition to parenthood, couple relationship quality, parental mental health, parenting in general, and child adjustment are also impacted (Feinberg 2002, 2003; Cowan and Cowan 1988). Coparenting thereby not only helps parents transition to a new family system but also contributes to all family members' well-being.

Feinberg (2002) developed the universally-designed Family Foundation (FF) program based on the various literature about how parenting impacts both parents and children, and evidence regarding the benefits of the FF program has been accumulating for over a decade (Feinberg 2003; Feinberg and Kan 2008; Feinberg et al. 2009, 2016). However, the FF program was designed based on practical evidence from the United States, so exploring the effectiveness of this program for Japanese families is important. In Japan, a prenatal education program facilitated by nurses, midwives, or public nurses in obstetrics clinics, hospitals, or local government is well-established and is attended by women during pregnancy. The contents of a prenatal education program mostly focus on childbirth preparation, including explanations of the delivery process, labor massage, and limited information about parenting (Nishi and Kayashima 2016). In other words, mothers and fathers are often not educated on how to share child care and household duties between both parents during the prenatal period. Thereby the current study aimed to develop a prenatal couples education program to enhance coparenting for Japanese couples, based on the prenatal part of the FF program. Then, we aimed to test the effectiveness of a couples' education program, namely how much this program affected childrearing, couples' relationship quality, parental mental health, and child adjustment among Japanese couples at 1 month and 3 months after childbirth.

Methods

Design and Participants

This pilot study used a quasi-experimental posttest-only design with a comparison group (Burns and Grove 2004). Participants were 29 couples who were expecting their first child and were married or living together at the time of recruitment.

Procedures

We used three methods of recruitment. First, we placed flyers on the bulletin board in obstetrics/gynecology clinics. Second, we explained our research to pregnant women in childbirth classes in obstetrics/gynecology clinics and hospitals. Finally, we used chain-referral-sampling. All participants voluntarily chose whether they would join the intervention or control group. They applied for the study by mailing in an application form, and we also gained a consent form by mail.

Questionnaires were conducted at baseline (at the time of enrollment; average weeks of gestation = 28.2, SD = 5.1), 1 month, and 3 months after delivery. All data were collected by mail or an online system. In both the intervention and control groups, each par-

ent individually completed questionnaires concerning childrearing, overall couple relationship, parental mental health, and child adjustment. All data were collected from July 2016 to May 2017. Couples were paid an honorarium for their participation, subsequent to the time of evaluation, 3 months postpartum. The Ethics Committee of Tohoku University Graduate School of Medicine approved the study (2016-1-326).

Table 1 shows the descriptive statistics. There were no significant differences between intervention couples and control couples regarding baseline variables, including age, education, employment, medical history, and weeks of gestation. Couples in both groups could voluntarily participate in standard prenatal education classes through hospitals, clinics, and local authorities. Standard prenatal education is very familiar to pregnant women in Japan, and most pregnant women complete such a class. The class usually discusses the delivery process, labor massage, positions for easy delivery, and preparation for delivery in hospitals. Additionally, intervention couples received a couples' education program that was developed for this study.

Development of a couple education program as an intervention

We developed a couple education program for this study based on the prenatal portion of the FF program (Feinberg 2002; Feinberg and Kan 2008) in accordance with the 'Process of translation and adaptation of instruments' by the World Health Organization (2010). The goals in our program are to promote the relationship quality in couples, parental mental health, parenting quality, and child adjustment through enhanced coparenting, similar to that of the FF program (Feinberg 2002). Contents of our program focus on parental conflict resolution and problem-solving, communication, and mutual support strategies. This program consisted of two interactive classes (3 hours each). Instructional modalities of this program include lecture, discussions within each couple, rehearsing conversations in likely parenting situations, watching a short video, and homework to practice essentials of this program with partners.

In this program, four major changes were made to the FF program to apply it to Japanese people. Regarding the composition, we reduced the number of classes to attend from five to two. This was necessary because Japanese couples expecting their first child were usually too busy during pregnancy to be able to attend a five-class program. They tend to be dual-earners, had prenatal checkups every one to four weeks, and participated in childbirth education at clinics and hospitals. We also modified the contents, expressions, and metaphors, using expressions and cultural references tailored to Japanese people. In addition, the short videos were carefully selected, and Japanese subtitles were added. We also increased the number of couple discussions, using PowerPoint slides that reflected the content of those videos in the initial viewing. Considering that Japanese people tend to be shy or embarrassed about sharing their opinions, this program did not involve group discussion, and instead mainly relied on couple discussions. In these ways, the program was revised to be more applicable to Japanese people, based on the perspectives of Japanese women's health nursing, midwifery, clinical psychology, and obstetrics.

Regarding the implementation of this program, one facilitator conducted all classes to provide consistent quality and effects of the intervention. Moreover, third parties witnessed this program, checking the content of the curriculum, and giving feedback to the facilitator, which led to stable intervention quality. Classes were offered two

Table 1. Sample descriptive statistics, by gender and intervention status.

	Mothers					Fathers				
	Intervention (n = 16)		Control (n = 5)		p value	Intervention (n = 16)		Control (n = 5)		p value
	n	%	n	%		n	%	n	%	
Age (M, SD)	31.6	3.6	32.2	6.9	0.866	32.3	4.9	34.0	7.2	0.552
Education										
less than 13 years	6	37.5	2	40.0	1.000	6	37.5	3	60.0	0.611
more than 14 years	10	62.5	3	60.0		10	62.5	2	40.0	
Employment before childbirth										
retire/no job	7	43.8	3	60.0	0.635	0	0.0	0	0.0	-
fulltime	9	56.3	2	40.0		16	100.0	5	100.0	
Past medical history										
no	14	87.5	5	100.0	1.000	15	93.8	4	80.0	0.429
yes	2	12.5	0	0.0		1	6.3	1	20.0	
Fertility treatment										
no	11	68.8	3	60.0	1.000	-	-	-	-	
yes	5	31.3	2	40.0		-	-	-	-	
Pregnancy complication										
no	12	75.0	3	60.0	0.598	-	-	-	-	
yes	4	18.6	2	40.0		-	-	-	-	
Number (times) of participation in prenatal classes (M, SD)	2.0	1.6	2.4	2.5	0.678	0.4	0.6	1.0	1.0	0.145
Gestational weeks at delivery (M, SD)	39.2	1.2	38.0	1.6	0.083	-	-	-	-	
Modes of delivery										
vaginal delivery	14	87.5	3	60.0	0.228	-	-	-	-	
c-section	2	12.5	2	40.0		-	-	-	-	
Husband attending the birth										
no/could not	6	40.0	1	20.0	0.613	-	-	-	-	
yes	9	60.0	4	80.0		-	-	-	-	
Sex of infant										
boy	11	68.8	3	60.0	1.000	-	-	-	-	
girl	5	31.3	2	40.0		-	-	-	-	

Chi-squared test and Student's t-test.

days a week, including weekdays and weekends, and couples could select their preferred day from a calendar. A class included one or two couples. As this program mainly relied on couple discussions, the effect of differences in class size was supposed to be very small. All intervention couples completed all of the classes until an average of 31.7 weeks pregnancy (SD = 3.2). In addition, no harm to any participant occurred during the classes.

Measures

Primary outcome: The primary outcome is childrearing, which we defined as how parents cooperate with their childrearing, and how much parents engage in childrearing in this study. Childrearing was

evaluated by the Brief Version of the Coparenting Relationship Scale (CRS) (Feinberg et al. 2012; Takeishi et al. 2017) and parenting time on a typical working/non-working day.

The CRS comprised 14 items, utilized 7-point Likert responses, and was sorted into 7 subscales: Coparenting Agreement, Coparenting Closeness, Coparenting Support, Endorsement of Partner's Parenting, Division of Labor, Coparenting Undermining, and Exposure to Conflict. For instance, Support indicates that one's partner respects one's competence as a parent and upholds one's parenting decisions and authority (e.g., "My partner appreciates how hard I work at being a good parent"). Cronbach's alphas for the total scores ranged from 0.23 to 0.69 for mothers and fathers at all measurement times ($\alpha =$

0.23 for fathers at 3 months postpartum).

Parenting time was reported by each father. We did not assess mother's parenting time because it has been indisputably shown that mothers are much more engaged with childrearing than fathers during early parenthood in Japan (Statistics Bureau, Ministry of Internal Affairs and Communications 2017). Thus, we considered whether fathers' parenting time increased in the interventional group—a key measure of the program's effect.

Secondary outcome: The program's secondary outcome includes the couple relationship, parental mental health, and child adjustment. Couple relationship indicates the romantic, sexual, companionate, and emotional aspects between husband and wife. Couple relationship was evaluated by the Marital Adjustment Test (MAT) (Locke and Wallace 1959; Misumi et al. 1999) and the Marital Love Scale (MLS) (Sugawara et al. 2002). The MAT assesses various dimensions of the couple relationship quality such as Demonstrations of Affection, Preference of How to Spend Leisure Time, and Confidence in One's Partner. Cronbach's alphas ranged from 0.47 to 0.73 for mothers and fathers through all measurement times. The MLS specifically targets romance, affection, and love in marital quality. Cronbach's alphas ranged from 0.80 to 0.93 for mothers and fathers through all measurement times.

Parental mental health includes poor parent-to-infant bonding and depression in this study. Parent-to-infant bonding was evaluated by the Mother-to-Infant Bonding Scale Japanese version (MIBS; Taylor et al. 2005; Yoshida et al. 2012), which describes parents' feelings toward their infants, such as the absence of affection, hate, rejection, or impulses to harm. Cronbach's alphas ranged from 0.18 to 0.68 for mothers and fathers through all measurement times ($\alpha = 0.18$ for fathers at 1 month postpartum). Depression was measured with the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff 1977; Shima et al. 1985) and the Edinburgh Postnatal Depression Scale (EPDS) (Okano 1996). The CES-D is widely used to measure current levels of depressive symptoms. Cronbach's alphas were 0.80 to 0.94 for mothers and fathers throughout all measurement times. The EPDS is also widely used, especially for postpartum depression evaluation. Cronbach's alphas were 0.82 to 0.95 for mothers and fathers throughout all measurement times.

Child adjustment indicates that an infant can soothe itself to recover from being distressed. Child adjustment was evaluated by ratings on Soothability with the corresponding subscale of the Short Form of the Japanese Infant Behavior Questionnaire-Revised (IBQ-R) (Gartstein and Rothbart 2003; Nakagawa et al. 2009). The item is, for example, "When patting or gently rubbing some part of the baby's body, how often was she/he soothed immediately?" Cronbach's alphas ranged from -0.13 to 0.84 for mothers and fathers through all terms ($\alpha = -0.13$ for fathers at 1 month postpartum). Nakagawa and Sukigara (2005) reported that the IBQ-R did not necessarily have good internal consistency as a behavioral checklist.

Analysis

We used multiple regression analysis to test the effect of each group (1 = intervention; 0 = control) for each outcome: coparenting, couple relationship, parental mental health, childcare time, and child adjustment. Each outcome was set as a dependent variable, and then the intervention status (intervention/control) and the other control variables were set as independent variables on SPSS Statistics 25. We adjusted by control variables such as the intervention status, sex,

age, and education level of parents, as well as the sex of the child. Education level was categorized by whether the parent had more than 14 years of education (1) or not (0). The same control variables were utilized in all analyses, excluding parenting time, since that only took the father's answer into account. For this reason, when parenting time was analyzed, we also excluded parents' sex from the control variables. For this analysis, the required sample size was 40-50 individuals, meaning 20-25 couples.

Results

All participants were Japanese and were at least 20 years of age. The CONSORT flow diagram is shown in Fig. 1. Among the 29 couples, two couples were deemed ineligible because of multiple births ($n = 1$) and because either parent had a psychiatric disorder ($n = 1$). Three couples were excluded because of non-response after childbirth, and three couples were excluded because the mother was living with her parents, but not with her partner, during pregnancy and childbirth. Of the remaining 21 families, all fathers were working full-time; 71.4% of the mothers were working during pregnancy, but all of the mothers took parental leave during the first 3 months after birth. The mean ages were 31.8 years ($SD = 4.4$) for mothers and 32.7 years ($SD = 5.4$) for fathers. The educational attainment level of most participants was more than fourteen years, at 61.9% of mothers and 57.1% of fathers. Fourteen of the babies born were boys (66.7%), and 7 were girls (33.3%).

Although the current study focused on the couple education program impact, we noted several interesting features of the descriptive data. First, as shown in Table 2, parenting times on both working days and non-working days were longer for fathers in the intervention group. Most other scores of fathers in the intervention group were also better than those in the control group. We note, however, that the levels of depression were worse among fathers in the intervention group. For mothers, some of the scores were better, and some were worse in the intervention group. In our preliminary analysis, the correlations between independent variables in multiple regression analysis were less than $r = 0.04$ or were not significant. According to Grewal et al. (2004), when multicollinearity is between 0.4 and 0.5, Type II error rates tend to be quite small. These correlations showed that there was no harmful multicollinearity in the multiple regression analysis.

The results of the couple education program's impact are summarized in Table 3. We found the effects of this program on only two outcomes. First, our anticipated effect on childrearing was supported. Being in the intervention group had a significant positive effect, with a moderate effect size, on the Coparenting Support score at 1 month after childbirth ($\beta = 0.457$, $p < 0.003$, $R^2 = 0.187$). There was no significant effect on the other scores related to childrearing, at 1 month or 3 months after birth. Second, the anticipated effect on child adjustment was supported. Being in the intervention group also significantly predicted Soothability at 3 months after childbirth, with a moderate

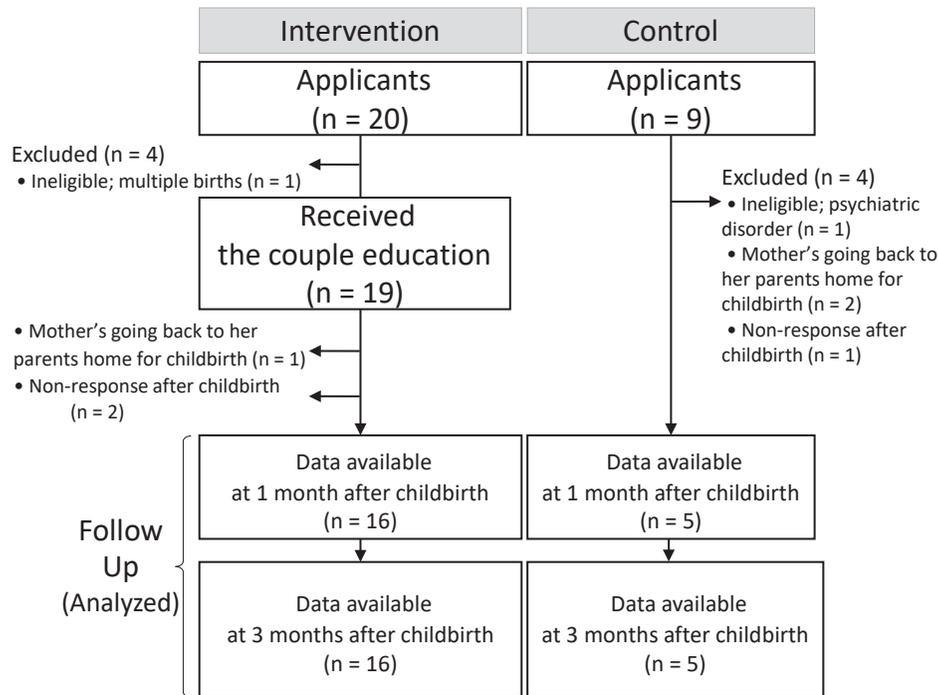


Fig. 1. CONSORT Flow Diagram of the quasi-experimental study.

effect size ($\beta = 0.429$, $p < 0.006$, $R^2 = 0.157$), but not at 1 month after birth. For the remaining outcomes—couple relationship (MAT and MLS) and parental mental health (CES-D, EPDS, and MIBS)—we did not find significant effects at either 1 month or 3 months postpartum.

Discussion

In this study, we have developed a prenatal couple education program to enhance coparenting for Japanese couples. The established couple education program showed noticeable effects on strengthening childrearing and child adjustment: moderate-sized intervention effects on coparenting support at 1 month postpartum and infants' Soothability at 3 months postpartum.

The coparenting support that a parent felt—namely, whether that parent felt appreciated by their partner for the childcare provided—seemed to be enhanced by the contents of this program. This effect might originate in how the program instructed parents to recognize negative narratives in their partner's behavior and how to change them to positive narratives and to appreciate their partners when their partners were working hard. van Egeren and Hawkins (2004) reported that coparenting support might produce a progressive chain of inventive, cooperative interchanges as each parent builds upon the other's lead. Moreover, early coparenting can predict subsequent coparenting (Schoppe-Sullivan et al. 2009). Thus, increased coparenting support in early parenthood at 1 month after birth is important for subsequent parenthood and coparenting. However, this study found no significant impact on childrearing at 3 months after birth, suggesting that this program does not

have a long-term effect on childrearing. The original FF program was developed to encourage new parents to create and shape the early coparenting relationship (Feinberg 2002). In our program, the facilitator also encouraged couples to imagine early childrearing. Couples may struggle to imagine the postpartum period, much less later phases of childrearing. Therefore, this program needs additional classes conducted during the postpartum period to follow up with participants.

Next, the intervention group showed significantly better Soothability scores at 3 months after birth. Some studies have recently indicated that child temperament development is affected by pregnancy (Buffa et al. 2018) or parents' parenting behavior (Weaver et al. 2004), supporting this study's use of our prenatal program. Cusick and Georgieff (2016) have stated that the first 1,000 days after birth are crucial for brain development, and Heckman (2006) claimed that the best investment was in quality early childhood development programs. Thus, this program, which promotes coparenting conducted during pregnancy is meaningful for child development. This finding also indicates that it is possible to measure child adjustment with the scale for soothability in 3-month-old infants. Although previous studies (Feinberg and Kan 2008; Feinberg et al. 2016) reported significant effects on soothability as well, they evaluated infants more than 6-months-old. Our results provide new evidence that this scale of soothability cannot precisely measure the differences in child adjustment in 1-month-old infants.

Despite those positive results, there was no evidence that this program has an impact on most scales of childrear-

Table 2. Means and Standard Deviations for study outcomes.

	Mothers							
	1 month after childbirth				3 months after childbirth			
	Intervention (n = 16)		Control (n = 5)		Intervention (n = 16)		Control (n = 5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Childbearing								
CRS total score	43.1	10.0	35.6	19.7	37.5	16.8	39.0	11.9
CRS Endorsement	10.3	1.5	8.8	4.0	9.6	2.2	9.6	2.3
CRS Closeness	9.0	1.5	7.2	2.8	8.2	2.6	8.2	2.2
CRS Division	9.1	2.6	9.0	3.3	8.2	3.5	7.6	2.5
CRS Agreement	8.8	2.6	9.4	3.4	8.4	3.6	9.6	2.3
CRS Undermine	1.7	2.6	1.8	2.5	2.5	2.8	1.2	1.8
CRS Support	9.3	1.9	5.8	2.2	7.8	3.3	7.0	2.8
CRS Conflict	1.6	1.6	2.8	3.6	2.1	2.3	1.8	1.8
Couple relationship								
MAT	119.5	14.4	124.8	16.2	108.4	25.6	118.4	15.3
MLS	38.0	8.0	44.0	7.2	34.1	11.9	40.6	7.5
Parental mental health								
MIBS	2.4	2.5	2.0	1.6	1.1	1.6	2.0	1.9
CES-D	10.2	6.1	12.4	5.9	10.5	11.0	8.6	6.9
EPDS	5.9	3.9	6.6	4.9	5.1	5.9	3.8	4.4
Child adjustment								
Soothability	21.8	6.1	23.4	7.7	27.3	5.2	21.0	10.3
	Fathers							
	1 month after childbirth				3 months after childbirth			
	Intervention (n = 16)		Control (n = 5)		Intervention (n = 16)		Control (n = 5)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Childbearing								
CRS total score	38.3	5.0	35.8	7.6	46.2	8.1	43.6	9.8
CRS Endorsement	6.6	0.7	6.6	2.6	11.2	1.1	11.6	0.5
CRS Closeness	9.8	1.8	9.4	2.3	9.4	1.9	10.6	0.5
CRS Division	10.9	1.6	11.4	1.3	11.0	1.4	10.8	2.2
CRS Agreement	9.2	1.8	9.4	2.6	9.8	1.7	9.4	2.1
CRS Undermine	1.3	1.7	2.2	1.9	2.3	2.2	2.6	2.3
CRS Support	8.9	2.3	7.6	3.8	8.8	2.4	7.0	4.1
CRS Conflict	5.9	0.6	6.4	1.5	1.6	1.5	3.2	4.1
Parenting time (Working day)	151.9	222.2	78.0	72.2	137.8	185.7	78.0	54.5
Parenting time (Non-working day)	358.1	261.0	288.0	200.8	296.3	224.7	276.0	150.6
Couple relationship								
MAT	119.1	20.1	108.4	17.8	118.1	17.8	112.0	21.0
MLS	47.4	7.6	49.8	5.5	48.1	5.3	45.6	8.7
Parental mental health								
MIBS	2.4	1.9	2.6	1.5	2.0	2.0	2.8	2.0
CES-D	8.4	5.6	6.6	4.9	8.8	9.1	5.6	3.4
EPDS	4.7	4.2	3.8	2.9	4.3	4.3	1.2	1.6
Child adjustment								
Soothability	22.1	3.9	20.2	2.6	26.4	7.2	20.4	7.2

CRS, brief version of the coparenting relationship scale; MAT, marital adjustment test; MLS, marital love scale; MIBS, mother-to-infant bonding scale Japanese version; CES-D, center for epidemiological studies depression scale; EPDS, Edinburgh postnatal depression scale.

ing, couple relationship quality, or parental mental health. We considered three possible reasons for these results. First, Japanese people tend to be shy or embarrassed about sharing their opinions and conveying their gratitude or

affection to their partners. This program encouraged couples to convey their gratitude or affection because it must be beneficial effects for both parents and children. During this program, wives often said they could not remember sit-

Table 3. Effects of the couple education program at 1 month and 3 months after childbirth.

	1 month after childbirth		3 months after childbirth	
	β	p value	β	p value
Childbearing				
CRS total score	0.237	0.142	-0.034	0.816
CRS Endorsement	0.146	0.241	-0.077	0.572
CRS Closeness	0.275	0.079	-0.146	0.345
CRS Division	-0.053	0.734	-0.011	0.936
CRS Agreement	-0.056	0.732	-0.099	0.509
CRS Undermine	-0.100	0.553	0.148	0.364
CRS Support	0.457	0.003	0.139	0.373
CRS Conflict	-0.123	0.181	-0.114	0.467
Parenting time (Working day)	0.208	0.411	0.198	0.427
Parenting time (Non-working day)	0.172	0.492	0.037	0.882
Couple relationship				
MAT	0.088	0.591	-0.090	0.571
MLS	-0.193	0.172	-0.132	0.317
Parental mental health				
MIBS	-0.034	0.835	-0.215	0.184
CES-D	-0.003	0.984	0.169	0.286
EPDS	0.060	0.709	0.258	0.087
Child adjustment				
Soothability	0.033	0.839	0.429	0.006

Multiple regression analysis was utilized. The table shows results on the intervention status (intervention =1, control = 0). Each outcome was adjusted by age, education level, sex of participant, and sex of a child.

CRS, brief version of the coparenting relationship scale; MAT, marital adjustment test; MLS, marital love scale; MIBS, mother-to-infant bonding scale Japanese version; CES-D, center for epidemiological studies depression scale; EPDS, Edinburgh postnatal depression scale.

uations where they could thank their partners. Instead, wives could not help but think of frustrating situations that occurred with their partners. Meanwhile, husbands often avoid affection to their partners in this program. It is sometimes difficult for Japanese people to speak explicitly about their emotions, because Japanese culture and customs lead people to attach importance to reading others' feelings, thoughts, or intentions (Ikeda et al. 2002). The program, therefore, needs to be modified so that couples can practice conveying their gratitude or affection to their partners more often. The second reason was believed to be that two classes were insufficient to be effective. Namely, repetition is important in learning the essentials of this program. For example, one session could practice openly sharing opinions within couples for a minute, and then complete this activity three to four times per session. Lastly, it might be difficult to evaluate the effects of this program on Japanese couples using quantitative measurements, because Japanese people do not tend to report their reactions explicitly. To evaluate the subtle effects of this program, we should use qualitative evaluation, for instance, through interviews or video recording. Thus, the significance of the present study is the identification of improvement points of this program and evaluation methods, and these new understandings will

help further programs have better, more effective designs.

Originally, the division of labor along traditional gender lines is still prevalent in Japan (Yamaya 2011). Consequently, when the Japanese government implemented the policy that encouraged fathers to enjoy parenting, fathers have spent engaging in childcare much shorter than in the other countries yet (Cabinet Office 2016). Thus, this program focusing on coparenting is important in Japan. The context that originated from traditional gender roles seemed to be one of the reasons that this program showed minor effects on coparenting. However, attention to coparenting appears to be increasing, as men taking a childcare leave are getting increased (Gender Equality Bureau Cabinet Office 2018), and as more couples voluntarily applied for this program. In Japan, it is a transition period in which a concept of coparenting spreads, and this program is significant in the current situation that coparenting needs are increasing. Since enhanced coparenting during the transition to parenthood impacts parental mental health and parenting quality (Cowan and Cowan 1988; Feinberg 2002, 2003), modifying this program to be more effective will benefit both parents and children.

There are several limitations in the present study. We experienced some selection bias in the allocation methods

employed in this study. First, the results of this study might be better than what that observed in the general population because participants were willing to attend a class about coparenting. Moreover, control group might have included participants who were willing to coparent and contribute to society, which would have skewed the characteristics of the control group. Lastly, the sample size was insufficient to generalize as we estimated and recruited an appropriate sample size to conduct this pilot study. Consequently, we are planning another study using an appropriate sample size that is larger in order to standardize the effects of this program throughout Japan.

The other limitation of our study was the low reliability of the measures used, excluding the depression scales (EPDS and CES-D) and the MLS. It is also possible that the small sample size reduced the data reliability due to the large variability among participants.

In conclusion, we have developed a prenatal couple education program that focuses on coparenting for Japanese couples. This program shows beneficial effects on strengthening childrearing and child adjustment. On the other hand, this program shows no impact on most scales of childrearing, couple relationship quality, or parental mental health. Thus, more research with increased sample size is needed to improve intervention programs designed to teach effective coparenting to Japanese parents.

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Conflict of Interest

The authors declare no conflict of interest.

References

- Belsky, J. (1984) The determinants of parenting: a process model. *Child Dev.*, **55**, 83-96.
- Buffa, G., Dahan, S., Sinclair, I., St-Pierre, M., Roofigari, N., Mutran, D., Rondeau, J.J. & Dancause, K.N. (2018) Prenatal stress and child development: a scoping review of research in low- and middle-income countries. *PLoS One*, **13**, e0207235.
- Burns, N. & Grove, S. (2004) Quasi-experimental study designs. In *The practice of nursing research: conduct, critique, & utilization*, 5th ed., Philadelphia, PA, pp. 247-248.
- Cabinet Office (2016) Family affairs and childcare related time of couple having child younger than 6 years (Par a day, international comparison). https://www8.cao.go.jp/shoushi/shoushika/whitepaper/measures/w-2017/29webhonpen/html/b1_s1-1-4.html [Accessed : May 4, 2019] (in Japanese).
- Cowan, C.P. & Cowan, P.A. (1988) Who does what when partners become parents. *Marriage & Family Review*, **12**, 105-131.
- Cusick, S.E. & Georgieff, M.K. (2016) The role of nutrition in brain development: the golden opportunity of the "first 1000 days." *J. Pediatr.*, **175**, 16-21.
- Doss, B.D., Rhoades, G.K., Stanley, S.M. & Markman, H.J. (2009) The effect of the transition to parenthood on relationship quality: an 8-year prospective study. *J. Pers. Soc. Psychol.*, **96**, 601-619.
- Feinberg, M.E. (2002) Coparenting and the transition to parenthood: a framework for prevention. *Clin. Child Fam. Psychol. Rev.*, **5**, 173-195.
- Feinberg, M.E. (2003) The internal structure and ecological context of coparenting: a framework for research and intervention. *Parent. Sci. Pract.*, **3**, 95-131.
- Feinberg, M.E., Brown, L.D. & Kan, M.L. (2012) A multi-domain self-report measure of coparenting. *Parent. Sci. Pract.*, **12**, 1-21.
- Feinberg, M.E., Jones, D.E., Hostetler, M.L., Roettger, M.E., Paul, I.M. & Ehrenthal, D.B. (2016) Couple-focused prevention at the transition to parenthood, a randomized trial: eEffects on coparenting, parenting, family violence, and parent and child adjustment. *Prev. Sci.*, **17**, 751-764.
- Feinberg, M.E. & Kan, M.L. (2008) Establishing family foundations: intervention effects on coparenting, parent/infant well-being, and parent-child relations. *J. Fam. Psychol.*, **22**, 253-263.
- Feinberg, M.E., Kan, M.L. & Goslin, M.C. (2009) Enhancing coparenting, parenting, and child self-regulation: effects of family foundations 1 year after birth. *Prev. Sci.*, **10**, 276-285.
- Galinsky, E. (1987) *The six stages of parenthood*. Da Capo Lifelong Books, Boston, MA.
- Gartstein, M.A. & Rothbart, M.K. (2003) Studying infant temperament via the Revised Infant Behavior Questionnaire. *Infant Behav. Dev.*, **26**, 64-86.
- Gender Equality Bureau Cabinet Office (2018) Change in child care leave acquisition rate. http://www.gender.go.jp/public/kyodosankaku/2018/201806/201806_02.html [Accessed : July 10, 2019] (in Japanese).
- Grewal, R., Cote, J.A. & Baumgartner, H. (2004) Multicollinearity and measurement error in structural equation models: implications for theory testing. *Marketing Science*, **23**, 519-529.
- Heckman, J.J. (2006) Skill formation and the economics of investing in disadvantaged children. *Science*, **312**, 1900-1902.
- Holland, A.S. & McElwain, N.L. (2013) Maternal and paternal perceptions of coparenting as a link between marital quality and the parent-toddler relationship. *J. Fam. Psychol.*, **27**, 117-126.
- Ikeda, R., Nadamitsu, Y., Imai, C., Yoshitake, M., Kramer, E.M., Yamada, M. & Iwakuma, M. (2002) *Tabunka shakai to ibunnka communication (Multicultural Society and Intercultural Communication)*. edited by Isa, M. Sanshusha, Tokyo.
- Lawrence, E., Rothman, A.D., Cobb, R.J., Rothman, M.T. & Bradbury, T.N. (2008) Marital satisfaction across the transition to parenthood. *J. Fam. Psychol.*, **22**, 41-50.
- Locke, H.J. & Wallace, K.M. (1959) Short marital-adjustment and prediction tests: their reliability and validity. *Marriage & Family Living*, **21**, 251-255.
- Ministry of Health, Labour and Welfare (2016) Report of national survey results for single-parent households. <https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000188147.html> [Accessed : May 4, 2019] (in Japanese).
- Ministry of Health, Labour and Welfare (2018) About inspection results such as death cases by child abuse (the 14th report) and the number of child abuse consultation correspondence in child consultation center. https://www.mhlw.go.jp/houdou/0000173365_00001.html [Accessed : May 4, 2019] (in Japanese).
- Misumi, J., Mori, E. & Endo, K. (1999) Fufu Kan Chosei Test (Nihongo-ban) no Sakusei. *Maternal Health*, **40**, 160-167 (in Japanese).
- Nakagawa, A., Kimura, Y. & Sukigara, M. (2009) Development of short form of the Japanese Infant Behavior Questionnaire-Revised. *Studies in Humanities and Cultures*, **12**, 15-25 (in Japanese).
- Nakagawa, A. & Sukigara, M. (2005) How are cultural differences

- in the interpretation of infant behavior reflected in the Japanese Revised Infant Behavior Questionnaire? *The Japanese Journal of Educational Psychology*, **53**, 491-503 (in Japanese).
- Nishi, K. & Kayashima, K. (2016) The relationship between pregnancy behaviors of daily living/knowledge and the state of health guidance provided for pregnant women: with focus on first half of pregnancy. *Maternal Health*, **57**, 393-400.
- Okano, T. (1996) Nihon-ban Edinburgh Postnatal Depression Scale (EPDS) no Shinrai-sei to Datou-sei. *Archives of Psychiatric Diagnostics and Clinical Evaluation*, **7**, 525-533 (in Japanese).
- Onodera, A. (2005) Marital changes during the transition to parenthood. *Japanese Journal of Developmental Psychology*, **16**, 15-25 (in Japanese).
- Perren, S., von Wyl, A., Burgin, D., Simoni, H. & von Klitzing, K. (2005) Depressive symptoms and psychosocial stress across the transition to parenthood: associations with parental psychopathology and child difficulty. *J. Psychosom. Obstet. Gynaecol.*, **26**, 173-183.
- Radloff, L.S. (1977) The CES-D Scale: a self-report depression scale for research in the general population. *Appl. Psychol. Meas.*, **1**, 385-401.
- Schoppe-Sullivan, S.J., Weldon, A.H., Cook, J.C., Davis, E.F. & Buckley, C.K. (2009) Coparenting behavior moderates longitudinal relations between effortful control and preschool children's externalizing behavior. *J. Child Psychol. Psychiatry*, **50**, 698-706.
- Shima, S., Kano, T., Kitamura, T. & Asai, M. (1985) Atarashii Yoku-utsu-sei Jiko-hyoka-shakudo ni tsuite. *Clinical Psychiatry*, **27**, 717-723 (in Japanese).
- Slep, A.M.S. & O'Leary, S.G. (2005) Parent and partner violence in families with young children: rates, patterns, and connections. *J. Consult. Clin. Psychol.*, **73**, 435-444.
- Statistics Bureau, Ministry of Internal Affairs and Communications (2017) Survey on time use and leisure activities 2016. <https://www.stat.go.jp/data/shakai/2016/pdf/gaiyou2.pdf> [Accessed : May 4, 2019] (in Japanese).
- Sugawara, M., Yagishita, A., Takuma, N., Koizumi, T., Sechiyama, H., Sugawara, K. & Kitamura, T. (2002) Marital relations and depression in school-age children: links with family functioning and parental attitudes toward child rearing. *Japanese Journal of Educational Psychology*, **50**, 129-140 (in Japanese).
- Takeishi, Y., Nakamura, Y., Kawajiri, M., Atogami, F. & Yoshizawa, T. (2017) The reliability and validity of the Japanese version of the Coparenting Relationship Scale. *Journal of Japan Maternity Nursing*, **17**, 11-20 (in Japanese).
- Taylor, A., Atkins, R., Kumar, R., Adams, D. & Glover, V. (2005) A new Mother-to-Infant Bonding Scale: links with early maternal mood. *Arch. Womens Ment. Health*, **8**, 45-51.
- van Egeren, L.A. & Hawkins, D.P. (2004) Coming to terms with coparenting: implications of definition and measurement. *J. Adult Dev.*, **11**, 165-178.
- Vismara, L., Rollè, L., Agostini, F., Sechi, C., Fenaroli, V., Molgora, S., Neri, E., Prino, L.E., Odorisio, F., Trovato, A., Polizzi, C., Brustia, P., Lucarelli, L., Monti, F., Saita, E., et al. (2016) Perinatal parenting stress, anxiety, and depression outcomes in first-time mothers and fathers: a 3- to 6-months postpartum follow-up study. *Front. Psychol.*, **7**, 938.
- Weaver, I.C., Cervoni, N., Champagne, F.A., D'Alessio, A.C., Sharma, S., Seckl, J.R., Dymov, S., Szyf, M. & Meaney, M.J. (2004) Epigenetic programming by maternal behavior. *Nat. Neurosci.*, **7**, 847-854.
- World Health Organization (2010) Management of substance abuse. Process of translation and adaptation of instruments. https://www.who.int/substance_abuse/research_tools/translation/en/# [Accessed : May 4, 2019].
- Yamaya, M. (2011) Influence of gender ideology on married women's labor supply: a comparative analysis of four countries. *J. Soc. Sci. Fam. Stud.*, **18**, 67-81 (in Japanese).
- Yoshida, K., Yamashita, H., Conroy, S., Marks, M. & Kumar, C. (2012) A Japanese version of Mother-to-Infant Bonding Scale: factor structure, longitudinal changes and links with maternal mood during the early postnatal period in Japanese mothers. *Arch. Womens Ment. Health*, **15**, 343-352.