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The effectiveness of a parent participation improvement program for parents on partnership, attachment infant growth in a neonatal intensive care unit: A randomized controlled trial

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ABSTRACT

Background: Parent participation based on collaboration with nurses is recognized as an important concept in neonatal care. However, there is a lack of research providing specific strategies to promote parent participation in clinical activities, and there are few studies including both mothers and fathers.
Objectives: The purpose of this study was to develop a Parent Participation Improvement Program for parents in neonatal intensive care units, and to evaluate its effects on parents' partnerships with nurses, attachment to infants, and infants' body weight.
Design: The study consisted of two phases. The first phase involved development of the Parent Participation Improvement Program. The second phase, a parallel two-group randomized controlled trial to evaluate the effectiveness of this program, was conducted from February to August 2017 in the neonatal intensive care unit of a hospital in Seoul, South Korea. A total of 66 infants born at <37 weeks gestation, receiving high-flow nasal cannula or less respiratory support, and their 132 parents (66 mothers and 66 fathers) were approached for enrollment in the study. Sixty-six preterm infants were randomly assigned to the intervention group (n = 33 infants/66 parents) or the control group (n = 33 infants/66 parents).
Methods King's theory of goal attainment was used as the theoretical framework for this program. A literature review and in-depth interviews were conducted to organize and determine the contents of the program. To evaluate its effectiveness, in the second phase, the intervention group participated in a parent participation program comprised of an individualized interaction stage, a pre-participation stage, and an active-participation stage for two weeks. The control group was allowed routine visits. The Pediatric Nurse Parent Partnership Scale and the Maternal Attachment Inventory scale were employed, and infants were weighed on the same calibrated scale by a researcher.
Results: In the final analysis, compared with the control group, both the mothers and fathers in the intervention group reported significantly higher scores in partnership (Mann–Whitney U = 99.50, $p < .001$) and attachment ($t = 8.47$, $p < .001$), as well as significantly higher scores within all partnership subscales except "communication." There was no difference in infants' weight between the intervention and control groups.
Conclusions: The Parent Participation Improvement Program was proven effective in improving parents' partnerships with nurses and attachment to their infants. The results are expected to more effectively facilitate parent participation in neonatal care.

What is already known about the topic?

- The hospitalization of infants separates infants and their parents, which delays the attachment between them, putting normal growth and development at risk for premature infants.
- Integrating parents into a care team to promote their participation in neonatal care has become an important paradigm in the

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care of premature infants, but specific methods are needed to ensure that parental participation is actually conducted in clinical practice.
- The partnership between nurses and parents is important to provide appropriate support for the needs of parents who have different perceptions of, and expectations from parental participation.

What this paper adds

- Parents who are provided with a Parent Participation Improvement Program in neonatal care can significantly improve their attachment to their babies and their partnerships with nurses.
- The Parent Participation Improvement Program encouraged both parents to participate in care for their babies by involving fathers in such care.
- This program, consisting of individualized contents and goals appropriate for each parent, could be the basis for the development of protocols for further parent participation in neonatal intensive care units.

1. Introduction

1.1. Background

Premature infant births are increasing worldwide, and most premature infants are admitted to neonatal intensive care units for treatment (Chung et al., 2013). The hospitalization of infants causes parents to experience high levels of stress, and they do not have sufficient time to prepare for parenting because of the unexpected birth of premature infants (Chertok et al., 2014; Turan et al., 2008). In combination with the parents' unstable psychological and emotional status as described above, the unorganized and immature behavioral characteristics of premature infants interfere with the interactions between parents and infants, resulting in a negative impact on attachment. The attachment built on a stable bond with parents later becomes an important factor that affects the growth and development of infants (Browne and Talmi, 2005). However, owing to the many obstacles preventing attachment to their parents, premature infants in the neonatal intensive care units are at risk of delayed attachment and resulting problems in physical and emotional development (Sannino et al., 2016).

Bowlby and Robertson emphasized the role of family in minimizing the negative effects caused by the separation of families and hospitalized infants (Alsop-Shields and Mohay, 2001), and family-centered care has begun to draw attention to the core philosophy of child healthcare, including neonatal nursing (Hutchfield, 1999; Just, 2005; Shields et al., 2007). Family-centered care is an innovative approach to planning and evaluating nursing for children based on the partnership and cooperation of hospital staff and their families (Dunst and Trivette, 2009). It is considered an essential and important concept for infants and their parents in neonatal care (Gooding et al., 2011). Family-centered care in the neonatal intensive care units refers to multidisciplinary, integrated, and holistic healthcare for newborns and families that respects their dignity (Ramezani et al., 2014). In this context, family is involved in the treatment, and care for infants is based on a collaborative relationship with the staff. Among family members, the parents' roles and participation are particularly important as key components of family-centered care (Cleveland, 2008; Vasli and Salsali, 2014). The Family-Integrated Care model (O'Brien et al., 2013), which reflects the shift to a paradigm where parents are included as an integral part of the care team, emphasizes the practical dissemination of parent participation to the actual care of premature infants. In this model, parents were expected to provide care for their infants as primary caregivers. Parent participation can promote emotional bonding and attachment between them and their children, resulting in improvement in infants' physiological condition and development (Benzies et al., 2017; Broom et al., 2017; Just, 2005). To promote parent participation, the interactions between parents and hospital staff, especially nurses, is a very important factor (Ahlqvist-Bjorkroth et al., 2017; Craig et al., 2015; Hopwood et al., 2013). Because parents have different expectations, attitudes, and perceptions about such participation, nurses must effectively assess parents' desires and provide appropriate information and support based on a partnership that is mutually reciprocal (Coyne, 1995). The establishment of mutual goals and roles between nurses and parents and the provision of education and support to promote parental participation are deemed necessary (Coyne, 1995; Newton, 2000).

Many studies have been conducted on how to reduce the negative effects of separation due to hospitalization and to promote attachment between parents and premature infants (Melnyk et al., 2006; O'Brien et al., 2015; Sannino et al., 2016; Schroeder and Pridham, 2006). However, despite the need to include fathers, who experience feelings and emotions different from those of mothers, most researchers have focused more on mothers. Moreover, a discrepancy between theory and practice exists, meaning there remains a need for developing a family-centered care protocol that can be applied more effectively in a variety of clinical environments in neonatal care. Therefore, this study attempted to develop a more individualized intervention to effectively promote parent participation through interactions between parents and nurses, with the goal of ultimately realizing family-centered care.

1.2. Purpose

The purpose of this study was to develop a Parent Participation Improvement Program for parents in neonatal care and to evaluate its effects on parents' partnerships with nurses, attachment to infants, and infants' body weight.

1.3. Conceptual framework

This study was based on King's theory of goal attainment to promote parental participation. In neonatal intensive care units, nurses and parents exist within King's interpersonal system. Between them, the nursing process that includes action, reaction, interaction, and transaction is performed.

Action and reaction, which are shown through perception and judgment, confirm the needs to promote parent participation. The Parent Participation Improvement Program would be conducted through interaction and transaction. Interaction is a step for setting goals. In this stage, nurses and parents assess the obstacles and problems that may prevent parents from participating in care. Based on their findings, mutual goals are established, methods to achieve those goals are discussed, and, finally, a consensus is reached on how to achieve the agreed upon goals. Transaction is the purposive interaction for achieving mutual goals, whereby nurses provide an individualized Parent Participation Improvement Program and parents actively participate in those programs. During this transaction process, feedback alters the perceptions and judgments of nurses and parents, and affects existing behaviors and responses. The purpose of the Parent Participation Improvement Program is to increase partnerships with nurses, parental attachment to premature babies, and the growth of premature infants.

2. Methods

This study consisted of two phases. The first phase was developing the Parent Participation Improvement Program. The second phase, a parallel, 2-group randomized controlled trial with a prospective pretest-posttest experimental design, was conducted to evaluate the program's effectiveness.

2.1. Parent participation improvement program

2.1.1. Development of the parent participation improvement program

King's goal attainment theory was used as the theoretical basis in the development stage of the Parent Participation Improvement Program. A literature review was used to organize and determine the contents of the program. In-depth interviews were conducted for understanding parents' participation needs and for selecting possible activities for their participation in neonatal care. The draft version of the program was revised through consultation with neonatal experts, and its contents were validated. The final version of the program was printed in booklet form and provided to the parents of premature infants.

2.1.2. Contents of the parent participation improvement program

The Parent Participation Improvement Program was a two-week program consisting of three stages: an individualized interaction stage, a pre-participation stage, and an active participation stage.

During the first stage, the individualized interaction stage, the parents of premature infants identified the factors that impeded their parenting experience in the neonatal intensive care units and assessed individual requests for participation. Based on their answers, mutual goals were established to promote parent participation and interaction with nurses, and a consensus was reached regarding the specific educational contents to be implemented in the next stage. Participation areas such as successful feeding, breastfeeding, bathing, clothing, holding, and knowing baby signals were included in the goals. The contents and number of goals set by the parents varied. The goals of mothers tended to be more specific than those of fathers, and fathers tended to focus more on basic care, such as soothing, feeding, and holding babies safely. Fathers often expressed feelings of being less experienced in care relative to mothers.

The pre-participation stage occurred after the first stage and was conducted three times, each taking approximately 50–60 minutes, according to the educational and practical contents. This stage provided parents with information on selected topics based on interviews from the individualized interaction stage, and practical exercises were provided to enhance the technical aspects of actual parent participation. In actual practice, it included learning about the environment of the neonatal intensive care unit; the various tubes, lines, and devices often connected to infants; baby signals; and preterm infants' sleep cycles. Parents were introduced to areas where they could participate and were given information on specific methods to participate, that participation's positive effects on their premature infants, as well as overall education and practice for appropriate parent participation.

In the active participation stage, premature infants' parents, both mothers and fathers, engaged in nursing care a total of six times. Parental participation took place during the regular handling time for premature infants. If one of the parents was the primary participant, the other was required to participate along with him or her at least three times. Such participation lasted approximately 50–60 minutes and was based on the education and practice from the pre-participation stage. Parental participation activities performed in this study included changing diapers, breastfeeding, soothing, kangaroo care, bathing, clothing, developmental positioning, singing, and talking.

After finishing each session, parents recorded details of the activity and their thoughts and feelings, along with their levels of knowledge, technical development, and proficiency, in a standardized booklet developed by a researcher at the beginning of the study.

For example, in the individualized interaction stage, parents would talk to their nurse about wanting to feed their babies themselves but would express that they did not know how to and did not have opportunities. To solve this issue, parents and nurses would set a mutual goal for the parents to become proficient at feeding. After setting the goal, education and practice would be provided. In the pre-participation stage, parents would learn about and practice the appropriate posture for feeding, how to monitor the baby's breathing and sucking patterns during feeding, how to

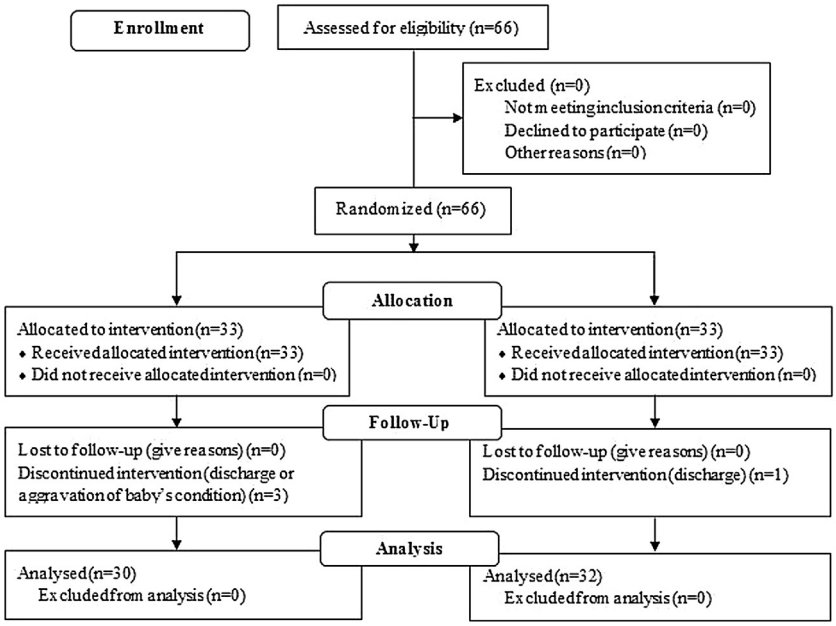

Fig. 1. Flow diagram for this study.

cope appropriately with problems, and how to interact effectively with the baby during feeding. Then, in the active participation stage, parents would be able to feed their baby without nursing intervention. The nurse, however, would be present to encourage and closely monitor the interaction. After the active participation stage ended, the parents would record the experience in their booklet, and the nurse would help to maintain safe and effective parent participation by giving them feedback.

2.2. Evaluation of the parent participation improvement program

2.2.1. Design

A parallel, two-group randomized controlled trial with a prospective pretest-posttest experimental design was carried out from February 1 to August 31, 2017, in the neonatal intensive care unit at a hospital in Seoul, South Korea.

2.2.2. Participants

Participants for this study were recruited from the neonatal intensive care unit in a hospital in Seoul, South Korea. The inclusion criteria for infants were (a) <37 weeks gestation, (b) receiving high-flow nasal cannula or less respiratory support, and (c) not expected to be discharged within one month. The inclusion criteria for parents were (a) willingness to spend time with the infants according to the program's plan, and (b) informed consent for participation. The sample size was calculated with the G-power program (3.1.9.2), and the sample size of 30 per group was considered sufficient for an estimated effect size of 0.65 with α value of 0.05 and power of 0.8 (Melnyk et al., 2006). Accounting for a 10 percent loss of subjects during the study, a total of 66 premature infants and their 132 parents (66 mothers and 66 fathers) were enrolled in this study.

2.2.3. Procedure and ethical considerations

The study was approved by the institutional review board of the hospital (code number: 2016-12−119-001). The researcher explained the purpose and process of the study to potential participants, and written informed consent was obtained from all parents who agreed to participate. Parents were informed that they could withdraw from the study at any time they wished with

Table 1
Demographic characteristics of infants and parents in the intervention and control groups and Homogeneity of dependent variables at baseline between two group.

Variables	Intervention Mean ± SD or n(%)	Control Mean ± SD or n(%)	χ^2or t	p
Infants	N=30	N=32		
Gender			0.003	0.960
male	18 (60)	19 (59.4)		
female	12 (40)	13 (40.6)		
Type of delivery			0.972	0.324
c/sec	16 (53.3)	21 (65.6)		
vaginal	14 (46.7)	11 (34.4)		
Gestational age (wk)†	28.42 ± 2.67	29.75 ± 3.19	−1.762	0.083
Birth weight(gm)†	1139.60 ± 424.39	1228.13 ± 441.79	−0.804	0.425
Order of birth			0.026	0.871
first	21 (70)	23 (71.9)		
second	9 (30)	9 (28.1)		
Corrected gestational age at enrolment(wk)†	33.60 ± 4.02	34.46 ± 3.73	−0.87	0.388
Body weight at enrollment(gm)†	1633.00 ± 563.42	1708.44 ± 808.41	−.424	0.67
Respiratory support at enrolment			1.953	0.377
none	15 (50)	18 (56.3)		
O_2 therapy	6 (20)	9 (28.1)		
High flow nasal cannula	9 (30)	5 (156)		
Length of stay(day)†	34.07 ± 34.92	34.91 ± 39.78	−0.088	0.930
Parents	N = 60	N = 64		
Age†	34.6 ± 3.59	34.97 ± 3.80	−0.554	0.58
Education			1.10	0.615
High school	8 (13.3)	7 (10.9)		
College	48 (80)	55 (85.9)		
Graduate	4 (6.7)	2 (3.1)		
Occupation			0.005	0.942
Employed	39 (65)	42 (65.6)		
Not employed	21 (35)	22 (34.4)		
Monthly income(ten thousand won)			5.50	0.107
< 300	1 (3.3)	1 (3.1)		
301-400	6 (20)	6 (18.8)		
401-500	10 (33.3)	19 (59.4)		
500 <	13 (43.3)	6 (18.8)		
Planned pregnancy				
Planned	27 (90)	27 (84.3)		0.71
Not planned	3 (10)	5 (15.7)		
Frequency of visit (times/week)			3.443	0.18
< 23	19 (31.7)	25 (39.1)		
4-5	21 (35)	27 (42.2)		
6 <	20 (33.3)	12 (18.8)		
Primary participant in program				
Father	2 (6.7)			
Mother	28 (93.3)			
Attachment at baseline†	3.58 ± 0.02	3.56±0.02	0.74	.46
Partnership at baseline†	3.88±0.06	3.93±0.05	−0.57	.57

NICU=Neonatal intensive care unit.
† *t*-test.

no loss of benefits, and the researcher explained that the collected data would only be used for research purposes. A total of 66 infants and their 132 parents (66 mothers and 66 fathers) were approached for enrollment in the study; the 66 infants were randomly assigned to either the intervention group (n = 33) or control group (n = 33) according to the order of participation. Randomization was followed using computer-generated random numbers (http://randomizer.org). In this study, four infants were excluded, three because of their unanticipated discharge from the hospital, and one because the infant became medically unstable, as reported in the participant flow diagram (Fig. 1). In the final analysis, a total of 62 infants and their 124 parents (62 mothers and 62 fathers) were included.

The parents in the intervention group participated in the Parent Participation Improvement Program for two weeks. The parents in the control group were provided with the usual care according to the open unit policy. They were not limited in the number of visits or time. They were given general information about the condition of infants, and if they wanted to, they could provide care for their baby such as feeding or kangaroo care. To minimize opportunities for between-group contamination, the individualized-interaction and pre-participation stages of the program were conducted separately in an education room in the neonatal intensive care unit.

In the intervention group, data collection was done at baseline (immediately before starting the individualized interaction stage) and after finishing the program using a self-administrated questionnaire. In the control group, after informed consent was documented, baseline data were collected. Two weeks later, a post-test questionnaire was completed. Infants' body weight was measured by the same researcher with the same scale on the same day the questionnaires were collected.

2.2.4. Instruments

The Pediatric Nurse-Parent Partnership Scale (Choi and Bang, 2013) was used to measure parents' partnerships with nurses. The self-reported questionnaire consisted of 34 items scored on a 5-point Likert scale. It was measured on 7 subscales: reciprocity, professional knowledge and skills, sensitivity, communication, sharing information, collaboration, and cautiousness. Higher scores indicated more positive partnerships with nurses. The Cronbach's alpha value was 0.96.

The Maternal Attachment Inventory, translated into Korean and revised (Han, 2002), was used to measure parents' attachment to premature infants. The self-reported questionnaire consisted of 26 items scored on a 4-point Likert scale. Higher scores indicate a higher level of attachment to infants. The Cronbach's alpha value was 0.85.

Infants' body weight was measured by a researcher with a Scale-Tronix 4802 pediatric/infant scale. After the zero point on the scale was checked before weighing, all devices attached to the infant, including diapers, were removed before weighing. The unit of weight measurement was grams (gm).

2.2.5. Data analysis

The data were analyzed using SPSS 16.0 for Windows. Parents and infants' basic information was summarized using frequency, percentage, mean, and standard deviation. The homogeneity of the two groups was assessed by a *t*-test and a chi-squared test. A Shapiro-Wilk test was used to test for normal distribution of the data. Two sample *t*-tests and a Mann-Whitney U test were conducted to determine the effects of the Parent Participation Improvement Program on attachment, partnership, and infants' body weight. A p value of <0.05 indicated statistical significance.

3. Results

In this study, the mother and father of a premature infant were considered as one dyad, and the results were analyzed using an average of the two parents' scores.

3.1. Demographic and clinical characteristics of the preterm infants and parents

In total, 62 infants and their 124 parents (62 mother-father dyads) were enrolled in this study. The intervention group consisted of 30 infants and their 30 mother-father dyads; the control group consisted of 32 infants and their 32 mother-father dyads. The demographic and clinical characteristics of these two groups are shown in Table 1, and no significant differences were found between the two groups. Additionally, no significant differences in the dependent variables were found between the two groups.

Table 2
Comparison of dependent variables between the two groups.

Outcome measures	Intervention (N = 30)			Control (N = 32)			t or Mann-Whitney U	p
	Pre Mean(SD)	Post Mean(SD)	Diff Mean(SD)	Pre Mean(SD)	Post Mean(SD)	Diff Mean(SD)		
Partnership	3.88(0.06)	4.37(0.04)	0.49(0.04)	3.93(0.05)	4.12(0.04)	0.19(0.02)	99.50†	<.001
Reciprocity	3.91(0.07)	4.44(0.04)	0.53(0.04)	3.95(0.06)	4.19(0.04)	0.24(0.03)	102.0†	<.001
Professional knowledge and skills	4.04(0.07)	4.46(0.04)	0.42(0.05)	4.15(0.07)	4.22(0.05)	0.08(0.02)	5.55	<.001
Sensitivity	3.70(0.09)	4.27(0.05)	0.57(0.06	3.79(0.08)	4.02(0.05)	0.23(0.04)	4.44	<.001
Collaboration	4.19(0.07)	4.61(0.05)	0.42(0.05)	4.11(0.06)	4.25(0.05)	0.14(0.04)	3.70	.001
Communication	3.57(0.07)	3.92(0.07)	0.36(0.05)	3.63(0.06)	3.98(0.05)	0.36(0.04)	427.5†	.46
Sharing information	3.77(0.08)	4.32(0.06)	0.54(0.05)	3.70(0.08)	3.93(0.06)	0.23(0.04)	4.85	<.001
Cautiousness	4.07(0.07)	4.65(0.05)	0.58(0.05)	4.09(0.06)	4.11(0.06)	0.02(0.03)	87.0†	<.001
Attachment	3.58(0.02)	3.88(0.01)	0.29(0.02)	3.56(0.02)	3.65(0.2)	0.09(0.01)	8.47	<.001
Body weight(gm)	1633.0 (563.42)	2025.67 (599.10)	392.67 (68.93)	1708.44 (808.41)	2076.88 (813.35)	368.44 (60.17)	359.50†	.09

Attachment scores were converted to 4 points.
Partnership scores were converted to 5 points.
Independent two sample *t*-test conducted for comparison of attachment between intervention group and control group.
Mann-Whitney U test conducted for comparison of partnership and body weight between intervention group and control group.
† Mann-Whitney U test, Diff = Difference.

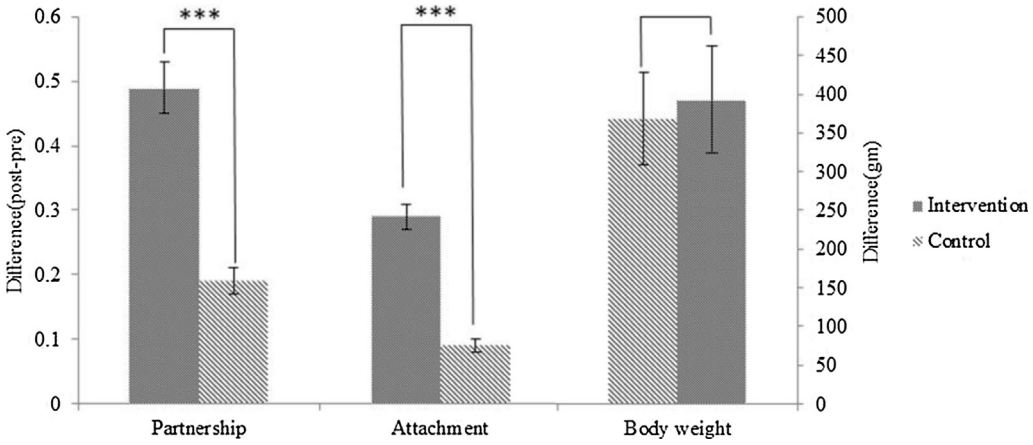

Fig. 2. A comparison of difference in dependent variables between two groups (***p < .001).

3.2. Effectiveness of the parent participation improvement program

Table 2 shows the partnership and attachment scores of the parents along with the infants' body weights for the different groups at pre-test and post-test (Fig. 2). A Mann-Whitney U test was performed to compare parents' partnership scores between the intervention and control groups. The difference between the partnership scores of the two groups was significant (Mann-Whitney U = 99.50, p < .001). In a comparison of the differences between the seven partnership subscales of the two groups, significant differences were found for six subscales, all except for "communication." In particular, the differences in the "professional knowledge and skills," "sensitivity," and "cautiousness" subscales were the largest (t = 5.55, p < .001, t = 4.44, p < .001, Mann-Whitney U = 87.0, p < .001).

In the independent two sample t-tests used to compare parents' attachment scores between the intervention and control groups, the difference in scores between the two groups was statistically significant (t = 8.47, p < .001).

A comparison of the difference in body weights between the intervention and control group infants showed no statistical significance (Mann-Whitney U = 359.50, p = .09).

Additional comparisons were performed between the mothers' and fathers' scores in attachment and partnership (Table 3). The Mann-Whitney U test differences both the mothers' and fathers' partnership scores between the intervention and control groups (mothers: Mann-Whitney U = 212.50, p < .001; fathers: Mann-Whitney U = 152.50, p < .001). The differences in both the mothers' and fathers' attachment scores between the two groups were also examined with a Mann-Whitney U test, and statistically significant differences were found (mothers: Mann-Whitney U = 146.5, p < .001; fathers: Mann-Whitney U = 84.5, p < .001). In the case of mothers, there was a significant increase in both attachment and partnership scores after the intervention. However, the increase in mothers' partnership scores was greater than the increase in attachment scores. For fathers' attachment scores, they increased by an average of 0.33 points in the intervention group; the fathers' partnership scores increased an average of 0.48 points after the intervention. In the intervention group, the fathers' attachment scores increased more than the mothers'. The fathers' partnership scores in the intervention group, however, increased less than the mothers' scores, but it was a significant increase compared with the fathers' scores in the control group.

After the program was completed, we interviewed the parents with the open-ended question: "Describe your experience of participating in the program." Researchers used the answers to identify their experiences and feelings about participation in the program.

Twenty-one of the 30 parents of premature infants commented on the lack of opportunity to participate in their baby's care during their usual visits, and the passive nature of their role before they participated in this program:

> "At first I didn't say I'd do it. Until the nurse asked me if I'd like to try, all I could do was watching the nurse take care of the baby."
> "Most of the visiting hours were spent just watching the baby sleep or taking pictures of the baby."

At the beginning of the parents' program, 13 parents expressed delight and excitement about being with their babies, while, at the

Table 3
Comparison of dependent variables in mothers and fathers of the two groups.

Outcome measures	Intervention (N=30)			Control (N=32)			Mann-Whitney U	*p*
	Pre Mean(SD)	Post Mean(SD)	Diff Mean(SD)	Pre Mean(SD)	Post Mean(SD)	Diff Mean(SD)		
Mothers								
Attachment	3.66(0.02)	3.91(0.01)	0.25(0.02)	3.62(0.02)	3.73(0.02)	0.11(0.01)	146.5	< .001
Partnership	3.93(0.06)	4.43(0.05)	0.5(0.05)	3.96(0.06)	4.21(0.04)	0.25(0.03)	212.5	< .001
Fathers								
Attachment	3.50(0.03)	3.84(0.01)	0.33(0.03)	3.50(0.03)	3.57(0.02)	0.07(0.02)	84.5	< .001
Partnership	3.83(0.1)	4.31(0.07)	0.48(0.05)	3.89(0.09)	4.04(0.07)	0.15(0.03)	152.5	< .001

Diff=Difference.
Attachment scores were converted to 4 points.
Partnership scores were converted to 5 points.

same time, they expressed concerns about fear and ambiguous feeling about their first attempt:

> "When I set my goals for the program, I was thrilled to have more time to spend with my baby, but when I tried to participate, most of the things I did for the first time were difficult and made me nervous."

> "The baby was so small that it was scary and awkward at first, but I liked it and was excited to have this time with the baby every day."
> "During the program, I was happy to come to the hospital and was always filled with excitement at the thought of meeting the baby."

As they participated in the program, 22 parents expressed greater confidence and participated in the care of their babies more actively. Moreover, 17 parents said they felt more responsible as parents:

> "I was relieved that the nurse kept reminding me that I was doing well, and I was able to participate in the care more actively with confidence."

> "Through the program, I got used to caring for my baby, singing songs and playing with him without knowing how much time had passed."

> "I was most afraid of feeding him with the bottle, but soon I was proud of myself as I got better day by day, and I felt the baby getting used to me."
> "I gained confidence that I could do something for my baby as a parent and felt I was necessary for my baby."

4. Discussion

The main findings from this study are that the Parent Participation Improvement Program is effective in increasing parental attachment to premature infants and partnerships with nurses in both mothers and fathers when compared to the control group.

First, the partnership scores of both mothers and fathers in the intervention group increased compared to those of the control group. There were also significant differences in the scores on "professional knowledge and skills," "sensitivity," and "cautiousness" subscales. Nurses' professional knowledge and skills mean that nurses should provide healthcare for babies through a delicate and professional approach. The care partnership is based on the interaction between nurses and parents and, for a successful partnership, it is necessary for nurses to be experts in guiding and supporting parents to effectively participate in their infants' recovery. Additionally, considering that the partnership attribute of "role negotiation" identified through conceptual analysis is incorporated into the "reciprocity" subscale of partnership, increase in "reciprocity" can be seen as indicating that "working together based on negotiations on goals and plans" presented in the partnership study by Bidmead and Cowley (2005) occurred during the program Lee, 2007 highlighted the importance of negotiations in nursing partnerships, and the program developed in this study effectively supported sufficient opportunities for negotiations between parents and nurses. As a result, partnership scores increased.

The individualized interaction stage of the program provided opportunities for parents to share opinions on participation and to discuss what kind of activities parents could be involved in, while interviews with the parents during the program development phase helped researchers understand in advance what the parents wanted to participate in and what they could actually participate in. This understanding is believed to have allowed parents to participate more actively and made it possible to provide more participation opportunities for parents. The partnership scores in the control group showed a significant increase after two weeks, which can be explained by the model of parental role change in the NICU presented by Norris and Hoyer (1993). They reported that, as time goes by, interaction occurs naturally between nurses and parents, and the parental role becomes increasingly active. Nevertheless, the partnership scores of parents in the intervention group increased significantly compared to the control group because the attributes of partnership suggested by many scholars were well reflected in this program, thereby facilitating the interactions between parents and nurses.

Meanwhile, in the "communication" subscale of partnership, the post-test score of the intervention group increased significantly, but not significantly when compared to the control group. This is because the contents of the program developed in this study focused on improving parental participation, with training and practice conducted mainly for achieving that goal. Based on the results of this study, it is necessary to establish specific strategies that can promote each of the partnership attributes so that parents and nurses can interact more effectively.

As for the results related to attachment, the findings of this study are consistent with Kaaresen et al. (2006) who identified the degree of parental stress by providing the Mother-Infant Transaction Program to parents of premature infants. It was shown that attachment, a subscale of the Parenting Stress Index (PSI), increased significantly in both mothers and fathers. Compared with previous studies, this paper has the limitation of being conducted on a smaller number of participants, and the contents of the program are different. However, considering the interactions of nurses and parents, setting mutual goals to increase parental participation, and including fathers as major participants, can be seen as more effective methods of intervention. Furthermore, this study helped parents actively participate in infant care such that they had sufficient time to communicate and interact with their premature infants throughout the program. This provided opportunities for proximity, reciprocity, and commitment, as shown in a concept analysis study on attachment (Goulet et al., 1998), and it can be considered to help ease the situation of parents separated from infants and to assist them in forming attachments. In a qualitative study by Fegran et al. (2008), mothers of premature infants said they believed that by participating in baby care, they regained an important position in their infants' lives but that their lack of skills made such participation burdensome. In this context, nurses continued to provide support and encouragement while parents actively participated in the program. Parents were no longer seen as mere observers in the care of premature infants and they were assisted in playing their roles as confident parents, providing a physical and psychological environment that allowed them to feel emotional stability while they bonded with their newborns.

The program did not target premature infants who were being prepared to be discharged from the hospital but instead offered the opportunity for parents to contact and interact with infants more quickly during hospitalization. The infants of the program's intervention group were hospitalized for 7–174 days. Bowlby (1977) explained that the six months after birth are very important in forming an attachment between mother and baby. This suggests that contact between parents and infant is, from birth, very important. The behavior and signals of premature infants that are unorganized compared to normal newborns can be difficult for parents to understand and respond to properly, but they can have time to maintain contact and interact with such infants by participating in their healthcare through this program.

In addition, by including fathers, this program is believed to have helped them form attachments with their babies, resulting in a higher total score of attachment than the control group. The fathers of premature infants admitted to the neonatal intensive care unit perceived contact with the baby as a positive experience, and viewed the baby as a special being with whom they shared emotional and physical similarities. This suggests that giving a father, who was excluded from the process of birth, the opportunity to participate in infant healthcare allows him to realize that he is an important person to the baby. The program seems to have been able to promote fathers' emotional stability and increase their confidence in taking care of their children. Moreover, it seems to have had a positive impact on increasing mothers' attachment scores because by involving both mothers and fathers, the burden of care is shared.

Finally, this study found that there was no significant difference between the experimental group and the control group in infant weight gain. Usually, premature babies gain weight by 20–30 g m/day on average (An and Shin, 2016). In this study, the average weight of premature infants increased by 28.04 gm in the intervention group and 26.31 gm in the control group. Although the difference between the two groups for weight gain was not statistically significant, the average weight gain for infants in the intervention group was higher than for the control group. The results are similar to those of Craig et al. (2015) who demonstrated that family-centered care, which focuses on the role of families involved in all treatments and care for the baby, had a positive effect on not only the baby's cognitive and mental development, but also on his or her physical growth and development. A study by O'Brien et al. (2015) reported the same results: a statistically significant weight gain in premature infants who were part of family-integrated care. De Bernardo et al. (2017) also demonstrated significant weight gain in infants who were provided with a family-centered care intervention. The program in this study can be considered to provide a more positive environment and stimulation for premature babies by including their parents in caring for them.

Another reason for the premature weight gain in the intervention group compared to the control group may be the active encouragement of breastfeeding. Breast milk is an important factor in the health of premature infants (AAP, 2012) and is more effective in increasing the weight of premature babies than formula (Li et al., 2017). When setting specific goals at the individualized interaction stage, many parents stated that they wanted to breastfeed while participating in the program; thus, the program is believed to have had a positive effect on the growth of infants by increasing breastfeeding.

The reason for no difference between the two groups may be that potential factors affecting the growth of infants acted as a confounding factor, even though researchers tried to control for this by random assignment to groups. In addition, the study was conducted with a small number of participants and the intervention period was too short to precisely measure its effects. Therefore, further studies need to extend the intervention session and assess the effect on weight through long term follow-up.

5. Limitations

This study has some limitations. Although this paper presents a description of parents' experiences of participating in neonatal care through interviews, parental attachment was evaluated with quantitative data. As there are limitations in understanding parental attachment and experiences of participation through quantitative data, further qualitative studies are needed for in-depth exploration of attachment and experiences of parents.

Although the effectiveness of the program on partnerships and attachment has been identified, it may have been conducted over too short a period of time for parents and nurses to form a true partnership and to enable accurate measurements. In addition, the study period may be too short to assessing changes in the weight of premature infants due to parent participation. Therefore, future research needs to increase the duration of interventions and assess the effectiveness of the program on the partnership between nurses and parents through long-term follow-up studies.

Another limitation is the lack of a baseline assessment of the level of parent participation that may have potentially affected partnership and attachment. However, in this study, the researcher attempted to control the assessment through random assignment of participants to groups and found no significant difference in the scores at baseline.

Furthermore, the generalization of the program's effectiveness is limited because the study was conducted with parents of premature and immature infants in a single hospital in Seoul, Korea.

6. Conclusion

The aim of this study was to develop the Parent Participation Improvement Program for parents in neonatal care and to evaluate its effects. This program was proven effective for increasing attachment and partnership in both mothers and fathers. The program, developed in accordance with King's goal attainment theory, will serve as a useful reference in developing standardized guidelines for promoting parent participation in neonatal care, and it is expected to bridge the gap between theory and practice by applying family-centered care to the practical base of neonatal care.

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Ethical approval

This study was conducted after receiving Institutional Review Board approval from Samsung Medical Center (2016-12−119-001) in Seoul, South Korea.

Conflicts of interest

None of the named authors have any potential conflicts of interest, real or perceived.

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