

The Effect of Kangaroo Mother Care trained by Role-Playing Method on Mother-Infant Attachment and Sleep Quality of Mothers of Premature Infants: A Randomized Controlled Trial

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ARTICLE INFO	ABSTRACT
Article type: Original article	Background & aim: The premature infant imposes significant tension and stress on mothers and may affect quality of mothers' sleep. Therefore, this study was performed to assess the effect of kangaroo mother care using the role-playing method on the mother-infant attachment and sleep quality of mothers of premature infants.
Article History: Received: 21-Jul-2022 Accepted: 07-Jan-2023	Methods: This randomized clinical trial was conducted on 78 mothers of premature infants in the neonatal intensive care unit (NICU) of the hospital affiliated to the Hamadan University of Medical Sciences from July 2010 to September 2011. The samples were selected by convenience method, then divided into two experimental and control groups by simple random allocation method. Mothers in the experimental group learned kangaroo mother care in two 30-minute sessions using modeling and unique clothing (role-playing). Then, mothers performed 20-minute kangaroo mother care three times a day. Mothers in the control group performed kangaroo mother care through pamphlets and educational videos. Subjects completed mother-infant attachment and sleep quality questionnaires before, after, and one week after the intervention. Data analysed by SPSS (version 22).
Key words: Kangaroo Mother Care Method Role playing Intensive Care Units Neonatal Premature Birth Sleep	Results: There was statistically significant difference between the two groups in the mother-infant attachment one day ($P<0.011$) and one week ($P<0.012$) after the intervention. Also, a statistically significant difference was seen between the two groups in the mothers' sleep quality one day ($P<0.001$) and one week ($P<0.002$) after the intervention.
	Conclusion: Training of kangaroo mother care by role-playing method could be used as a therapeutic technique in the NICU to improve mother-infant attachment and maternal sleep quality.

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Introduction

The neonatal period is one of the most sensitive and consequential periods of growth and development (1-2). However, many infants which born prematurely are admitted to the neonatal intensive care unit (NICU) due to respiratory problems, temperature instability, blood pressure, heart rate, and respiratory, heart,

and neurological diseases (3-6). Epidemiological studies show that 9.6 to 12.9 million premature infants are born annually, accounting for 5 to 15% of the world's live births (7). In Iran, 160,000 births occur annually; approximately 8 to 12% are born prematurely and need specialized and unique care (7-8).

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Mothers of premature infants experience severe emotional shock and feelings (9). Mothers cope with many difficulties for a premature and incapacitated infant who needs special equipment and care to survive, so they face severe emotional shock which leads to decreased patience in the care of the infant. Dealing with a premature NICU admitted infant is one of the most sensitive and stressful stages for parents, especially mothers it can have adverse and long-term effects on mothers' life (10). The most significant adverse effects of premature birth on mothers are feelings of inadequacy and intolerance, incompatibility, sadness, anxiety, fear, worry, guilt, anorexia, inability to breastfeed, depression, and sleep disorders (11-13). They also experience significant changes in family relationships, work, social activities, family responsibilities, and even the interactions and attachments between mother and newborn (3). A premature infant inside an incubator or warmer under a ventilator or oxygen therapy with multiple serums and lines attached may cause these mothers to doubt their ability to care for the baby. They are unable to adapt to the baby's condition and needs; therefore, they reported intolerance in caring for their infant (12). As a result, they less participate in the care of their infants (14).

The mother's constructive interaction with the baby is affected by intolerance and adaptation to the conditions (15). Poor interaction and attachment, discrimination, and feelings of inefficiency, in addition to aggravating grief, anxiety, depression, anorexia, general weakness, and sleep disorders lead to mother-infant separation and disrupt the attachment process (16-17). However, practical attachment and initial communication between mother and infant, especially in premature infants, lead to more intimacy between mother and infant and have a decisive role in the development of physical and mental growth, increasing the probability of infant survival and improving social relationships (18). Mothers who have a close interaction and attachment with their babies and are diligent in meeting their needs experience a greater sense of competence and empowerment and consequently create a greater sense of security in their babies (15, 19-21).

One of the best indicators of the quality of life is effective sleep which has a tremendous impact on people's daily performance. The quality of sleep is a complex concept that is defined based on verbal and psychological criteria such as the feeling of sleeping well and calmness in going to sleep and it is difficult to measure it (22). Sleep disorders and deprivation are the most critical problems for mothers of premature infants, as studies show that more than 30% of mother's experience insomnia after the birth of a premature baby (23-24), which has harmful physical effects. Adequate and high quality sleep is a source of energy for thinking and relaxation of body and soul. Poor quality sleep makes the mother face difficulties in caring for and communicating with premature infants hospitalized in the NICU ward (25).

Accordingly, caregivers, especially NICU nurses, are obliged to reduce the consequences of the separation of mother and baby and to improve and accelerate the attachment between mothers and their infants with the aim to enhance mother-infant interaction and attachment for their continuous presence at their infant bed, encourage and support participation in care (2-5). Kangaroo mother care is one of the most critical participatory care to promote infants' health and improve mothers' sense of empowerment (26-27). Kangaroo mother care is formed through skin-to-skin contact between mother and baby and affects three dimensions, including the infant's health, the mother-infant relationship, and maternal satisfaction and empowerment (13, 28-31). Some studies have indicated that kangaroo mother care improved the physical health of preterm infants (8, 11). Kangaroo mother care is a bilateral interaction between mother and baby. Therefore, it can also affect mothers' physical and mental health (18, 21). Kangaroo mother care causes the secretion of oxytocin and decreases cortisol, increasing the feeling of calm, vitality, high quality sleep, social response, and pain tolerance, reducing the mother's stress, anxiety, and worry (32-34).

Some studies also have examined the effectiveness of kangaroo mother care in promoting mother-infant attachment and maternal sleep quality (15,19). Helmar et al. (2020) and Mayfield (2019) stated that kangaroo mother care increased maternal cognition of

their infant's sensory behaviors and improved mother-infant interactions (15,19). ZahedPpasha et al.(2018) and Creti et al. (2017) reported that kangaroo mother care reduced anxiety, and depression, improved sleep disorders, and increased sleep hours and sleep quality of mothers (23, 25). However, some of these studies used pamphlets and lectures to evaluate the effectiveness of kangaroo mother care on mother-infant attachment and maternal sleep quality. However, no study has evaluated the impact of role-playing kangaroo mother care on mother-infant attachment and maternal sleep quality. So the current research was designed with the aim to examine the impact of role-playing kangaroo mother care on mother-infant attachment and the sleep quality of mothers of premature infants.

Materials and Methods

This randomized clinical trial was conducted in the NICU of a hospital affiliated of the Hamadan University of Medical Sciences, Iran from July 2021 to September 2022. The Ethics Committee of the Hamadan University of Medical Sciences approved the current research (Umsha.rec.1399.1041) and recorded it at the Iranian Registre Clinical Trials Center (20190703044082N5).

The inclusion criteria were: mothers with preterm infants weighing ≤ 1800 g and aged ≥ 30 weeks or with fifth minute Apgar score of ≥ 7 without any severe physical disorders. In addition, mothers aged ≥ 18 years with the ability to read and write no psychiatric problems (depression, bipolar disorder, etc.), no use of psychiatric drugs and tobacco during and before pregnancy, and had willingness to participate in the study were included. Exclusion criteria were: the infant's death, the infant's transfer to another hospital, and the mother's absence in one day of the intervention. The sample size was determined based on the survey of Karimi et al. (2016) (14), with $\beta = 80\%$ and $\alpha = 0.05$. The sample size of 40 subjects with considering 10% attrition rate in each group, and 80 mothers were selected by the convenience method and then it was assigned to two groups of control and intervention using a table of random numbers. One mother of infants from each group was excluded from the study due to changes in the physical condition (Figure 1).

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right)^2 (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

In this study, the demographic information form including nine questions (mother's age, mother's education, mother's job, father's age, father's education, number of children, birth rank and economic status).

The Brockington Mother and Infant Attachment Self-Report Questionnaire, designed by Brockington in 2006, was used to assess maternal and infant attachment. This tool has 25 questions in four areas: impaired bonding (twelve questions), rejection and anger (seven questions), anxiety about care (four questions), and the risk of abuse (two questions) based on the six-point Likert scale (0 to 5). The lowest score in this questionnaire is 0 and the highest score is 125. A high score indicates greater attachment(35). The face validity, content, and reliability of the Iranian version of this questionnaire were reported by Khoramirad et al.(2020), and its reliability was determined as 87% by Cronbach's alpha method (36).

The sleep quality scale is valid for assessing sleep disturbance parameters (sleep disturbance factors, sudden awakening, difficulty falling asleep, and sleep duration). This scale was designed in the United States by Veran Snyder Halpern in 1987 (37). It includes 15 questions in three areas: 1- disturbance (interrupted sleep and delay in sleeping (questions 1-5), 2- effectiveness (effect of sleep on creating freshness and well-being (questions 6-11), and 3- supplementation (nap and sleep during the day (questions 11-15). Each question is scored on a visual scale from 0 to 100 mm and numbered at a distance of 5 mm. The total score of this tool is from 0 to 1500; a higher score indicates less sleep disorder. The face validity, content, and reliability of the Iranian version of this questionnaire were determined by Mashayekhi et al.(2016), and its reliability was determined to be 0.83 by Cronbach's alpha method (38).

The questionnaires were completed in a self-administered manner. The time to complete the questionnaires was about 20 minutes. Before starting the study, the researcher introduced herself and explained the objectives and methods

of the study. Written informed consent was obtained from all the participants. The confidentiality of data was assured for the participants. The subjects could leave the study at any stage of the research and lack of participation or withdrawal had no consequences for them.

Each mother in the experimental group attended in the two sessions of 30 minutes over two days in the conference room and was trained to do kangaroo mother care by the role-playing method. First, the researcher informed the mother about how to take care of the baby by the role-playing method, hug the baby, how the baby looks, and caressing the baby. Then, the researcher helped them wear a special blouse designed based on the standard and protocol of kangaroo mother care. These blouses were loose with sleeves and had few buttons at a distance from the front of the dress that could be easily opened and closed. The mother then sat on a chair in a sitting or semi-sitting position and the researcher placed the baby model vertically between the mother's breasts and fastened the buttons on the bottom of the mother's blouse. The baby model was entirely placed between the mother's breasts and was covered in the mother's clothes to reduce the possibility of falls and hypothermia. The researcher then stood next to the mother and asked her to try to caress the model while embracing it, smiling at the model with making eye contact (to reduce mothers' fear of touching the head and body of the premature infant). Mothers in the intervention group performed the intervention three times a day (once per shift) and an average of 20 minutes (a total of one hour per day) for their infants for seven days with the supervision and full support of the researcher. Mothers in the control group performed kangaroo mother care using pamphlets and lectures. Another person (research assistant) who was unaware of the allocation of the subjects in the intervention and control groups collected the questionnaires on mother-infant attachment and mothers' sleep quality one day before and after the intervention, and one week after the intervention.

Data analysis was done by SPSS (version 22) and descriptive statistics (mean, standard deviation, number, percent). Kolmogorov-Smirnov test was applied to confirm the normal

data distribution, then analytical statistics were analyzed with an independent t-test and repeated measures analysis of variance. An Independent t-test was employed to compare the mean scores of mother-infant attachment and sleep quality between the two groups at three times measurement. Moreover, repeated measures analysis of variance was applied to compare the mean score of mother-infant attachment and sleep quality in the two groups. $P < 0.05$ was considered statistically significant.

Results

The mean maternal age in the experimental group was 33.07 ± 2.47 years, and in the control group was 32.96 ± 2.28 years; no significant difference was found between the two groups in the mean age of mothers ($P = 0.91$). The majority of mothers in the experimental and control groups had a diploma educational degree ($P = 0.88$) and were housewives ($P = 0.81$). Fathers' mean age in the experimental group was 40.08 ± 2.24 years and in the control group was 40.17 ± 2.47 years. The economic situation of most families in both groups was average. Most of the infants (62.50%) in both groups were female. The mean age of neonates in the experimental group was 13.14 ± 1.24 days and in the control group was 13.54 ± 1.78 days. The mean weight of the neonates in the experimental group was 1667.39 ± 7.14 gr and in the control group was 162.28 ± 7.31 gr. Demographic information was similar in two groups ($P > 0.05$) (Table 1).

Before the intervention, no statistically significant difference was found between the experimental and control groups in mother and infant attachment scores ($P = 0.94$). But independent t-test indicated a significant difference between the experimental and control groups in the mean scores of all areas. The total mother and infant attachment scores in one day ($P = 0.011$) and one week ($P = 0.012$) after the intervention indicated a more significant impact. Also, based on analysis of variance, attachment scores in four areas and total scores, one day and one week after the intervention increased in the two groups compared to before the intervention.

There was a statistically significant difference between mother-infant attachment scores in the experimental group and the control group before and after the intervention ($P < 0.001$). It indicated

that kangaroo mother care training methods, role-playing, pamphlets, and educational videos improved mother-infant attachment (Table 2).

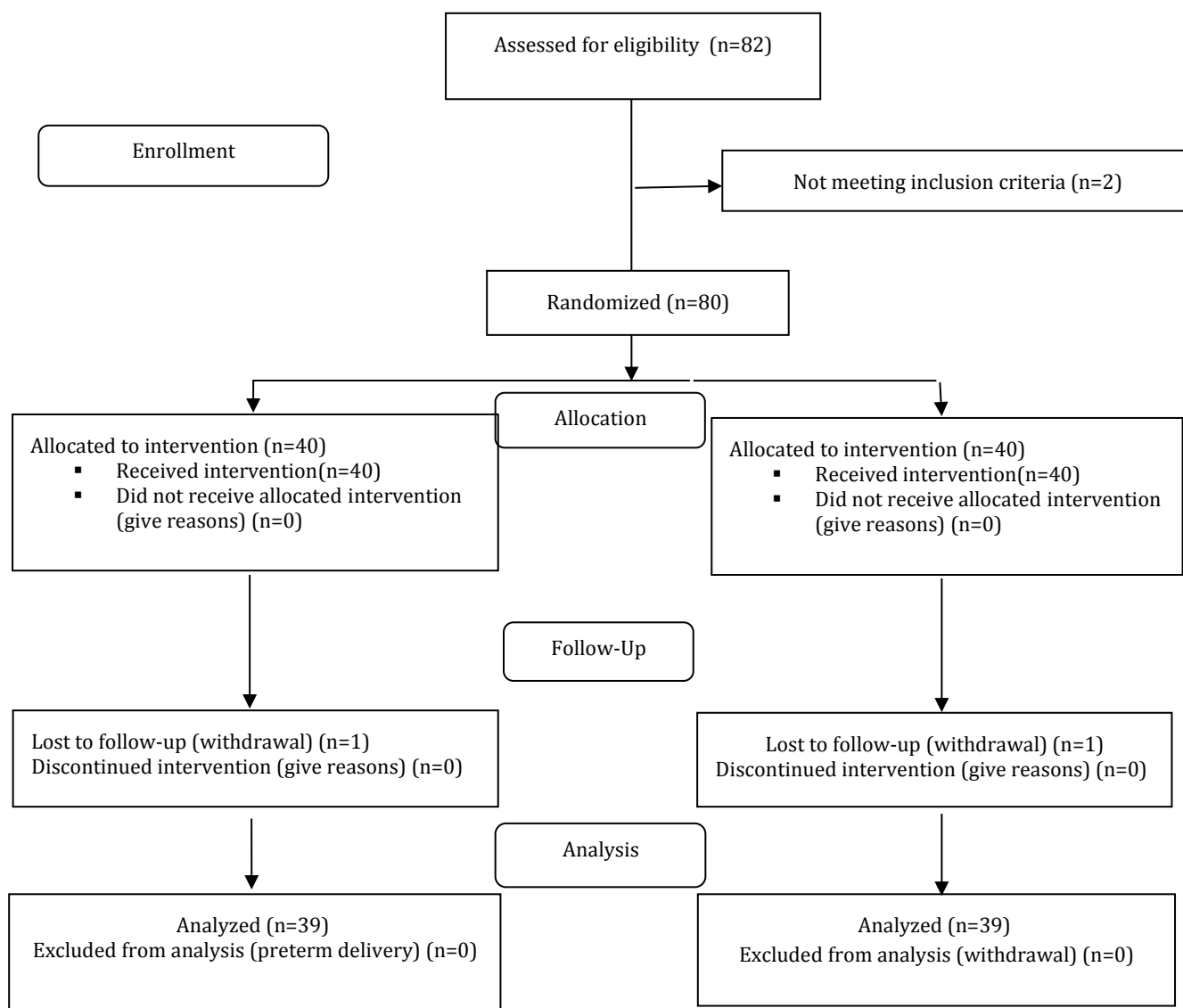


Figure 1. The CONSORT flow diagram of intervention in the two groups

Table1. Demographic information of the participants in the study

Variable	Test group Number(percent)	Control group Number(percent)	Test statistics	P-Value
Mother's age (years)				
18-24	10(25.64)	10(25.64)	2.78	0.91
25-31	11(28.21)	11(28.21)		
32-38	10(25.64)	11(28.21)		
39-45	8(20.51)	7(17.94)		
Mother's education				
Elementary	5(12.82)	6(15.38)	2.74	0.88
Diploma	20(51.28)	21(53.85)		
Bachelor	9(23.08)	8(20.51)		
Master's degree and higher	5(12.82)	4(10.26)		
Mother's job				
Housewife	20(51.28)	22(56.41)	2.38	0.81
Employee	11(28.21)	11(28.21)		
Self-employment	8(20.51)	6(15.38)		
Father's age				
24-33	20(51.28)	20(51.28)	2.41	0.87
33-44	12(30.77)	13(33.33)		
45-55	7(17.94)	6(15.38)		
Father's education				
Elementary	8(20.51)	7(17.94)	2.91	0.86
Diploma	22(56.41)	21(53.85)		
Bachelor	4(10.26)	6(15.38)		
Master's degree and higher	5(12.82)	5(12.82)		
Father's job				
Employee	11(28.21)	12(30.77)	2.76	0.83
Self-employment	22(56.41)	21(53.85)		
Unemployed	6(15.38)	6(15.38)		
Number of children				
Children 2	21(53.85)	22(56.41)	2.27	0.86
Children 3	11(28.21)	11(28.21)		
Children 4	7(17.94)	6(15.38)		
Birth rank				
Second child	21(53.85)	20(51.28)	2.46	0.86
Third child	12(30.77)	11(28.21)		
Fourth child	6(15.38)	8(20.51)		
Economic status				
Weak	6(15.38)	6(15.38)	2.38	0.89
Medium	22(56.41)	21(53.85)		
Good	11(28.21)	12(30.77)		

Before the intervention, no statistically significant difference was observed between the experimental and control groups in the

meanscores of the three domains and the total scores of sleep quality of mothers (P=0.95).

Table 2. Comparison of the mean scores of mother-infant attachments between the two groups

Groups	Before intervention Mean (Standard deviation)	The first day after the intervention Mean (Standard deviation)	Seventh day after intervention Mean (Standard deviation)	Test statistics	P-Value
Faulty mother-infant transplant					
Experimental	3.28(72.59)	3.36(121.15)	3.15(123.96)	3.61	<0.001
Control	3.24(73.02)	3.86(98.52)	3.93(111.96)	4.72	<0.001
Test statistics	1.31	2.64	2.93		
P-Value	0.90	0.0012	0.011		
Rejection and anger					
Experimental	3.65(71.23)	3.13(119.32)	3.27(124.04)	2.71	<0.001
Control	3.47(71.34)	3.56(89.98)	3.51(114.16)	3.48	<0.001
Test statistics	1.57	2.36	2.59		
P-Value	0.91	0.011	0.013		
Care anxiety					
Experimental	4.68(81.07)	4.93(119.92)	4.37(123.56)	2.66	<0.001
Control	3.76(80.44)	4.79(99.44)	4.39(116.64)	3.78	<0.001
Test statistics	1.41	2.54	2.76		
P-Value	0.92	0.011	0.011		
Risk of harm to the baby					
Experimental	4.25(80.11)	4.65(120.44)	4.10(124.04)	2.21	<0.001
Control	4.71(80.96)	4.06(101.04)	4.57(116.88)	2.53	<0.001
Test statistics	1.66	2.87	2.96		
P-Value	0.92	0.014	0.012		
Total score					
Experimental	4.66(83.54)	4.89(120.63)	4.87(124.56)	2.32	<0.001
Control	83.28(4.52)	4.86(98.24)	4.56(114.92)	3.74	<0.001
Test statistics	2.54	3.65	3.87		
P-Value	0.94	0.011	0.012		

Table 3. Comparison of mean sleep quality scores of mothers between the two groups

Groups	Before intervention Mean (Standard deviation)	The first day after the intervention Mean (Standard deviation)	Seventh day after intervention Mean (Standard deviation)	Test statistics	P-Value
Sleep disorder					
Experimental	7.28(980.79)	6.66(1247.78)	6.77(1431.96)	5.11	<0.001
Control	7.21(984.07)	6.86(1127.89)	6.74(1298.72)	4.98	<0.001
Test statistics	4.11	4.643	4.62		
P-Value	0.89	<0.001	<0.001		
Effectiveness					
Experimental	6.78(976.01)	6.78(1239.32)	3.27(1427.04)	4.71	<0.001
Control	6.27(976.78)	6.56(1131.08)	6.71(1301.36)	4.78	<0.001
Test statistics	4.43	4.62	4.59		
P-Value	0.95	<0.001	<0.001		
Supplementary sleep					
Experimental	6.48(982.01)	6.23(1258.61)	6.27(1451.56)	4.77	<0.001
Control	6.76(981.97)	6.29(1115.43)	6.39(1278.64)	4.63	<0.001
Test statistics	4.21	4.35	4.52		

Groups	Before intervention Mean (Standard deviation)	The first day after the intervention Mean (Standard deviation)	Seventh day after intervention Mean (Standard deviation)	Test statistics	P-Value
P-Value	0.92	<0.001	<0.001		
Total score					
Experimental	6.76(981.24)	6.51(1231.13)	6.67(1436.78)	4.72	<0.001
Control	6.62(981.57)	6.67(1123.24)	6.43(1276.84)	4.69	<0.001
Test statistics	4.14	4.85	4.87		
P-Value	0.95	<0.001	<0.001		

However, the independent t-test showed a statistically significant difference between the experimental and control groups in the mean scores of all areas and the total score of mothers' sleep quality one day and one week after the intervention ($P < 0.001$), which indicated the more significant impact of role-playing kangaroo mother care than routine care. Also, based on analysis of variance, mothers' sleep quality in three areas and the total score increased one day and one week after the intervention in each group compared to before the intervention. A significant difference was found in mothers' sleep quality scores in the experimental group and the control group before and after the intervention ($p < 0.001$), which indicated that kangaroo mother care training, role-playing and pamphlets, and educational videos improved the quality of mothers' sleep (Table 3).

Discussion

The aim of this study was to examine the impact of role-playing kangaroo mother care on mother-infant attachment and the sleep quality of mothers of premature infants.

The current research indicated that care through role-playing and routine care effectively promotes mother-infant attachment and the sleep quality of mothers of premature infants. However, a significant difference was found between the two groups in improving mother-infant attachment and maternal sleep quality, which means the role-playing method is more effective compared to the usual method in promoting mother-infant attachment and sleep quality of preterm infants in neonatal intensive care units.

Similar to the findings of the current research, the results of the study by Cho et al. (2021) in

Korea revealed that kangaroo mother care improves maternal and neonatal attachment and reduces mood disorders and postpartum maternal depression (39). In the study of Cho et al. (2021) kangaroo mother care has been presented by lecture and pamphlet method. However, in the present study, in addition to providing routine kangaroo mother care training (pamphlets and lectures), the role-playing method was used to perform kangaroo mother care training. The findings of the present study showed that both approaches significantly affect maternal and preterm infant attachment. However the kangaroo mother care method by role-playing method improved the interaction between mother and baby more than routine kangaroo mother care training (pamphlets and lectures). It is noteworthy that in the study of Cho et al., the effect of kangaroo mother care on maternal and infant attachment was evaluated and no follow-up was performed, but in the present study, the impact of embracing care was made in two ways, especially the role-playing method on the attachment of mother and premature infant, and there was a follow-up period. The higher mean scores of attachment in the present study than that of Chou et al. could be due to differences in the type of intervention and tools used.

On the other hand, Adeli et al. (2017) stated that embracing care promotes attachment of the mother and term infant, but in their study, no statistically significant difference was reported between embracing care alone and embracing care with eye contact (16). In the study of Adeli et al., the effect of embracing care on maternal and infant attachment was evaluated in the delivery room for one hour without educating the mother, while the present study evaluated

the impact of embracing care in two methods of routine care (pamphlet and lecture) and role-playing on mothers and premature infants, and mother-infant attachment was followed up for one week after the intervention. Similar to the findings of the current research, the survey of Chen et al. (2017) also showed that kangaroo mother care increases the attachment of fathers and term infants (40). Although their findings are consistent with the present study, Chen et al. measured the effect of kangaroo mother care on the attachment of fathers and term infants for only three days, and there was no follow-up period. Karimi et al. (2016) reported that kangaroo mother care improves mother-infant attachment and reduces mother anxiety which is in line with the findings of the present study (14).

Helmar et al. (2020) also stated that kangaroo mother care increases attachment between mother and premature infant, which is in accordance with the current research (15). Although in their study, both kangaroo mothers and fixed face pattern care have taught, there was no statistically significant difference in the main result. In the present study, one group received routine kangaroo mother care (pamphlet and lecture) and the other group received kangaroo mother care through role-playing, which showed that the role-playing method was much more effective on mother-infant attachment.

Searching literature showed that no study was available to examine kangaroo mother care's effect on mothers' sleep quality. Accordingly, other studies examining the sleep quality of mothers with full-term and preterm infants have been used for discussion. Similar to the present study, the findings of Zahedpasha et al. (2017) showed that kangaroo mother care is effective on maternal mental health and sleep quality of mothers with premature infants (25). However, in their study, the effect of kangaroo mother care by pamphlet method was investigated, and the control group did not receive any intervention. In the present study, both groups received the kangaroo mother care training and the quality of mothers' sleep was more desirable in the role-playing method. There was also no follow-up in the Zahedpasha's research.

One of the notable limitations of the current research was the small sample size. Therefore, studies with larger sample size in different

communities are recommended to be performed in the future. In addition, mothers in the current study were followed for one week after the intervention; it is suggested that the effectiveness of kangaroo mother care on the quality of mothers' sleep and attachment between mother and infant in mothers of premature infants be examined with more longer follow-up period. Kangaroo care training with a role-playing method is one of the strong points of this study, which has improved the mother's attachment to the baby and the mother's sleep quality.

Conclusion

The current research revealed that role-playing and routine methods of care effectively promote the quality of mother's sleep and attachment between mothers and infants. In addition, training the kangaroo mother care by the role-playing method improved the quality of mothers' sleep and attachment between mother and infant compared to routine methods. So, it is recommended to apply role-playing and routine methods as therapeutic care techniques in clinical settings during infants' admission in NICU in order to improve the mother's quality of sleep and attachment between mother and infant.

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Conflicts of interest

Authors declared no conflicts of interest.

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