

# Maternal Role Adaptation Scale in Neonatal Intensive Care Units (MRAS: NICU): Development, Validation and Psychometric Tests

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## Abstract

**Background:** Maternal role adaptation involves conceptualization and establishment of a responsible maternal role, which is characterized by a new identity and formation of mothering behaviors. Becoming a mother in intensive care unit is very different from becoming a mother with a term infant at home. The aim of the study was to develop a valid and reliable tool for assessment of maternal role adaptation of mothers with preterm neonates admitted to neonatal intensive care units.

**Methods:** This was an exploratory study which was conducted in 2 phase of qualitative and quantitative. A 90-item scale was developed after semi-structured interviews with 25 mothers and review of literature. After merging the similar items, it reduced to 45-item scale. Validity was determined through assessment of face, content and constructs validities, and reliability was confirmed through internal consistency and test-retest.

**Results:** Face validity led to elimination of 2 items, and further 8 items were eliminated through content validity index with cut-off point 0.79 and content validity ratio with cut-off point 0.42. Thus, the number of items reduced to 35-item. In exploratory factor analysis, 6 factors were identified that explained 54% of the variance. Construct validity led to elimination of 3 other items, and the final scale was developed with 32 items. Cronbach's alpha and intra-class correlation coefficient were 0.77 and 0.81 respectively.

**Conclusion:** The 32-item "Maternal role adaptation scale in mothers with preterm neonates admitted to neonatal intensive care units" (MRAS: NICU) is a valid and reliable tool.

**Keywords:** maternal role adaptation, Neonatal Intensive Care Unit, preterm neonate, reliability, tool development, validity

## 1. Introduction

Mothering is the most important role for a woman (Haddadi, Chaldi, Sajjadi, & Lehi, 2011). Becoming a mother leads to adaptation of major changes in cognitive, emotional-social and behavioral functions (Shin & White-Traut, 2007). Such psychological changes can be affected by the woman's particular circumstances, beliefs and attitudes, socioeconomic status, readiness and knowledge, and also her social and mental conditions, and the more developed a person is in this area, the better her personal adaptation will be (Mercer, 2004).

Maternal role adaptation involves conceptualization and establishment of a responsible maternal role, which is characterized by a new identity and formation of mothering behaviors (Mercer, 2004). Mothers who fail to suitably adapt to their maternal role will perform poorly in this role, especially in mother-child relationship (Mercer & Ferketich, 1995). In fact, a mother can take care of her child, only when she accepts her maternal role (Bailey,

2010).

Becoming a mother in intensive care unit is very different from becoming a mother with a term infant at home. Admission of an infant to neonatal intensive care unit is a life-changing event for the mother and members of the family (Devellis, 2011). According to the theory of assuming maternal role or motherhood, a mother whose child has been admitted to NICU has little opportunity for looking after and interacting with her child, and these delays assuming her maternal role (Mercer, 2004).

Today, a number of service providers use depression assessment tools such as Edinburgh Postnatal Depression Scale to screen mothers for postpartum depression. Many of these interventions are performed not just to assess depression, but also to evaluate women's satisfaction with the role or experience of motherhood. Tools that measure mood alone do not provide any information about women's experience of motherhood, and it is wrong to assume that poor mood as measured by Edinburgh Postnatal Depression Scale reflects dissatisfaction with maternal role. Hence, interventions aimed at increasing women's satisfaction with motherhood need to use a tool that is sensitive to this area (Matthey, 2011; Javadifar, 2012).

Development of a quantitative tool that can identify the need for help in certain circumstances and assess interventions performed in a particular situation is highly important, and can enhance our understanding of maternal-child relationship and maternal role and help improve the quality of postpartum primary cares. As we gain more knowledge about development, trend, role and experience of motherhood, it is more likely to recognize changed relationships and also improve health interventions (Javadifar, 2012).

One of the important and challenging parts of health care is assessment of mother's ability to take care of her child and also to properly and easily adapt to her maternal role. Identifying mothers who have problematic care behaviors in caring for their children, or have negative emotions and thoughts about motherhood, and their referral to specialists is essential and requires proper and valid assessment. Often, maternal and child healthcare providers are unable to carry out this assessment as they do not have the knowledge of mothering experience and there is no reliable and objective tool to measure components of motherhood. Hence, inclusion of such assessments in the set of postpartum care can have a major role in promotion of maternal health, appropriate development of infants, and improvement of quality of judgment of maternal and child service providers (Fowels & Horowitz, 2006).

Questionnaires such as Parental Stressor Scale: Neonatal Intensive Care Unit (PSS: NICU) (Miles, Funk, & Carlson, 1993), The perceived maternal parenting self-efficacy questionnaire (PMP-S-E) (Barnes & Adamson-Macedo, 2007), Barkin Index of Maternal Functioning (Barkin et al., 2010), Cognitive Adaptation of stressful events scale (Affonso, Mayberry, Lovett, & Paul, 1994), and The Being A mother scale (Matthey, 2011) have already been developed. However, in the search conducted, no tool was found that directly measured maternal role adaptation of mothers with preterm neonates. Thus, in the absence of such a tool, it is essential to develop one. Hence, it was decided to extract the basic structure of such a tool by identifying components and factors affecting maternal role adaptation of Iranian women with preterm neonates admitted to NICU, and thus develop a suitable tool according to Iranian culture.

## **2. Materials and Methods**

The present methodological study was conducted with the aim to develop a questionnaire (and examine its psychometric features) for the measurement of maternal role adaptation of mothers with preterm neonates admitted to neonatal intensive care units according to stages proposed by Schneider et al. (Schneider, Elliot, & LoBiondo-Wood, 2004).

### *2.1 Stage One*

In this stage, the concept of maternal role adaptation of mothers with preterm neonates admitted to NICU was extracted according to their experiences using a qualitative conventional content analysis study and in-depth semi-structured interviews with mothers of preterm neonates who were born before the 36<sup>th</sup> gestational week and had been admitted to NICU for at least one week. These mothers were Iranian, married and lived with their spouses, and had no previous history of delivering a preterm neonate that was admitted to NICU, no physical or psychological problems, no neonates with survival-limiting diseases or congenital abnormalities, and also had the willing to participate in this study; were recruited. Participants were primiparus and multiparus mother who had preterm neonates hospitalized in neonatal intensive care units and selected according to purposive sampling method. Ultimately data saturation was obtained after 25 interviews. Study setting consisted of a hospital affiliated to Social Security Organization, and other hospitals affiliated to Kermanshah University of Medical Sciences in the city of Kermanshah. With the permission of participants, interviews were recorded, and then immediately transcribed. Data were analyzed according to content analysis. Codes were extracted and categorized, and main

themes were identified. In the present study, codes were the same as variables or items in each theme.

### *2.2 Stage Two*

Items of the questionnaire were developed according to codes extracted from a qualitative study. Then, based on the extracted concept, main constructs of the questionnaire were determined, including interaction, self-efficacy, uncertainty, participation in care, and remote mothering. Review of literature was also used in extraction of themes. The questionnaire was designed as a self-reporting scale containing closed questions.

### *2.3 Stage Three*

Psychometric properties of the questionnaire were determined. Qualitative and quantitative methods were used in determining face validity. In qualitative method, 10 mothers were interviewed face-to-face, and issues such as levels of difficulty, suitability, and ambiguity were assessed. Next, in quantitative assessment of item impact, 10 mothers were asked to identify the importance of each item, and thus item-impact score was found for each item. Items scoring less than 1.5 were eliminated.

In qualitative content validity, 10 experts assessed the questionnaire in terms of grammar, appropriate use of words, necessity, importance, appropriate placement of items, and scoring. In quantitative content validity, Content Validity Ratio (CVR) and Content Validity Index (CVI) were used. To determine CVR, 20 experts reviewed each item. Based on Lawshe's table, items with CVRs higher than 0.42 were retained (Polit & Beck, 2013). CVI was assessed according to Waltz and Bausell's Content Validity Index. To this end, the questionnaire was made available to 20 experts to use Waltz and Bausell's Content Validity Index to determine relevance of each item using a 4-point Likert scale. Simplicity and clarity of each item were also assessed. According to Polit & Beck, CVI score higher than 0.79 is favorable, between 0.7 and 0.79 is debatable and needs modification, and less than 0.7 is a candidate for elimination (Polit & Beck, 2013).

Construct validity was determined using exploratory factor analysis. Total five samples per each item of questionnaire (35 item) was considered which was about 175 mothers, and ultimately 200 mothers were selected. In determining construct validity through exploratory factor analysis, Kaiser-Meyer-Olkin (KMO) test and Bartlett's Test (BT) were used. Items with factor loading less than 0.3 were eliminated, and elimination or preservation of items with factor loading between 0.3 and 0.5 was decided by research team.

### *2.4 Stage Four*

Reliability of the questionnaire was determined using internal consistency and stability. Internal consistency was found through Cronbach's alpha in a sample of 200 mothers. Stability was assessed through test-retest with 3 days interval in a sample of 20 mothers, and scores obtained in these tests were compared using ICC test.

### *2.5 Ethical Considerations*

Participants were informed of study objectives, and were assured of confidentiality and withdrawal at any stage. Informed written consents were obtained from all participants. The present study was approved by the university ethics committee.

## **3. Results**

In stage one, the concept of maternal role adaptation of mothers with preterm neonates admitted to NICU was defined by conducting a qualitative study. The results obtained showed that adaptation to maternal role in these mothers is a multidimensional concept that means growth, development, and self-efficacy, which generates less uncertainty in mothers for participation in child care, proper interaction and distant mothering.

In stage two, 90- items were developed through a qualitative study and review of literature. Then, overlapping items were integrated in meetings with research team, thereby reducing the number of items to 45. Items were arranged in 5 subthemes including distant mothering, self-efficacy, interaction, uncertainty, and participation in care. Scoring was based on a 5-point Likert scale from totally agree, agree, no comment, disagree, to totally disagree.

In stage three, a total of 10 items were eliminated; 2 items due to impact score less than 1.5, 3 items due to  $CVR < 0.42$ , and 5 items due to  $CVI < 0.79$ . Content validity index for the whole questionnaire was 0.93.

In the next stage, factor analysis was carried out on the remaining 35 items, and the results showed that the highest percentage of total variance (54%) is explained by the first 6 factors. KMO was 0.86, and BT was significant ( $P < 0.001$ ). Items with factor loading less than 0.3 were eliminated, and elimination or preservation of items with factor loading between 0.3 and 0.5 was decided by research team. Research team decided to eliminate items 9 and 10 with factor loading between 0.3 and 0.5, and item 21 was also eliminated because it could not be associated with

any of the factors. Accordingly, the first factor (participation in care) included 14 items (8, 19-20, 22-30 and 34-35), the second factor (self-efficacy) included 6 items (1-4, and 11-12), the third factor (distant mothering) included 3 items (31-33), the fourth (uncertainty) included 4 items (7, and 13-15), the fifth (interaction) included 3 items (16-18), and the sixth (growth and development) included 2 items (5-6) (Table 1). Finally, a 32-item questionnaire was developed.

Table 1. Factor loading of each item according to varimax factor rotation of “MRAS: NICU”

Factor/Item	1	2	3	4	5	6
1. I have matured since I became a mother.		0.539				
2. I have become more patient since I became a mother.		0.629				
3. I have become more hopeful since I became a mother.		0.587				
4. I have become more independent since I became a mother.		0.696				
5. I have become more active since I became a mother.						0.411
6. I have become more committed and responsible since I became a mother.						0.443
7. I regret having a baby.				0.782		
8. I have no problem embracing my child.	0.453					
9. Taking care of my child is easy.					0.442	
10. Seeing other infants in the ward (NICU) makes me hopeful.						0.433
11. I become more adept at taking care of my child as time goes by.		0.556				
12. Becoming a mother has enhanced my self-confidence.		0.592				
13. I am not sure of my child’ health in future.				0.675		
14. I am not sure if I can breastfeed my child.				0.442		
15. I am not sure if I can take care of my child.				0.730		
16. I have a good relationship with my child’s physician.					0.691	
17. I have a good relationship with nurses about child care.					0.674	
18. My relationship with my husband has improved since I became a mother.					0.441	
19. I have a good relationship with my child.	0.733					
20. I feel close to my child.	0.813					
21. I change my child’s pampers						
22. I massage my child.	0.702					
23. I caress my child.	0.816					
24. I cuddle my child.	0.796					
25. I like to stay with my child in the ward.	0.758					
26. I enjoy to breastfed my child.	0.657					
27. I frequently visit my child.	0.657					
28. I talk to my child.	0.722					
29. I try to stay with my child for as long as possible.	0.655		0.417			
30. When I’m away from my child, I cannot stop thinking about him/her.	0.691					
31. When I’m away from my child, I talk to him/her from afar.			0.527			
32. When I’m away from my child, I am concerned about his/her care.			0.724			
33. When I’m away from my child, I ask nurses and other			0.542			

mothers to look after him/her.		
34. I follow my child's condition.	0.582	0.558
35. I search for information about child care.	0.615	

Cronbach's alpha was 0.77 for the whole questionnaire, and between 0.61 and 0.92 for different factors. In retest method, ICC was 0.81 for the whole questionnaire and between 0.54 and 0.88 for different factors (Table 2).

Table 2. Cronbach's alpha and test-retest scores of factors and the whole scale

Factors	Cronbach's $\alpha$	Test-retest Reliability(ICC)
participation in care	0.92	0.73
self-efficacy	0.74	0.54
distant mothering	0.63	0.64
uncertainty	0.66	0.84
interaction	0.61	0.88
growth and development	0.61	0.69
Whole Questionnaire	0.77	0.81

#### 4. Discussion

"Maternal Role Adaptation Scale in Neonatal Intensive Care Units (MRAS: NICU)" was developed according to the explained concept in qualitative study with 32 items in 6 dimensions. Face, content, and construct validities and internal consistency and stability were all confirmed. It is worth noting that application of the above questionnaire is relatively easy and can be completed by mothers of preterm neonates admitted to NICU in about 10 minutes.

MRAS: NICU was developed based on qualitative part of this study and review of literature which contained 45 items in 5 dimensions, including distant mothering, self-efficacy, interaction, uncertainty, and participation in care. In face validity stage, 2 items were eliminated for having item impacts less than 1.5, thus reducing the number of items to 43. Face validity of the scale was therefore confirmed.

Content validity was performed by 20 experts. According to Polit & Beck, 3 experts are sufficient in determination of content validity (Polit, Beck, & Owen, 2007), but others believe that between 15 and 20 experts are needed (Burns & Grove, 2008). In a study by Javadifar, a panel of 10 experts was used in determining content validity (Javadifar, 2012). Given the complex dimensions of Maternal role adaptation in mothers of preterm infants admitted to NICU, use of greater numbers of experts from different fields seems essential. In the present study, content validity was confirmed with acceptable content validity index and content validity ratio.

Assessment of CVR and CVI led to elimination of 8 items, and CVI for the whole scale was found 0.93, which is within the acceptable range (Polit & Beck, 2006), and confirms content validity of the questionnaire. Javadifar reported content validity of 0.95 for "Adaptation to mothering role in primiparous mothers of term infants" questionnaire (Javadifar, 2012).

To determine construct validity through exploratory factor analysis, KMO and BT tests were used. Javadifar reported KMO of 0.67. This index varies from 0 to 1, and higher values indicate better factor analysis. Values less than 0.5 are considered unacceptable, from 0.5 to 0.7 moderate, 0.7 to 0.8 balanced, 0.8 to 0.9 desirable, and higher than 0.9 excellent factor analysis (Munro, 2005). In the present study, KMO was 0.86 for all constructs, indicating adequacy of sample size and favorable factor analysis. Kruit-Bartlett test was also significant ( $P < 0.001$ ), which confirms adequacy of the model.

In initial design of the scale, items were categorized in 5 dimensions, including self-efficacy, uncertainty, interaction, participation in care, and distant mothering. The results from factor analysis showed a close match between participation in care and factor one, self-efficacy and factor two, distant mothering and factor three, uncertainty and factor four, and interaction and factor five. A number of items in self-efficacy dimension were placed in a sixth dimension, namely growth and development. Hence, construct validity of the scale was confirmed through the agreement found between items of factors resulting from factor analysis and definition and dimensions of adaptation to mothering role in mothers of preterm neonates admitted to NICU. To determine construct validity, exploratory factor analysis was used by Javadifar for "Adaptation to maternal role in primiparous mothers of term

infants” questionnaire, Matthey for “The being a mother” scale, and by Barnes-Adamson-Macedo for “The perceived maternal parenting self-efficacy questionnaire (PMP-S-E)” (Barnes & Adamson-Macedo, 2007; Matthey, 2011; Javadifar, 2012).

In the present study, reliability was determined through internal consistency (Cronbach’s alpha) and stability (retest). Cronbach’s alpha was reported 0.76 in Javadifar study, 0.79 in Matthey study, 0.91 in Barnes-Adamson-Macedo study, and 0.87 in Barkin study (Barnes & Adamson-Macedo, 2007; Barkin et al. 2010; Matthey, 2011; Javadifar, 2012). Cronbach’s alpha of 0.7 and higher are the standard for reliability of a tool. However, alpha greater than 0.6 is acceptable in descriptive studies (Hajizadeh & Haji Asghari, 2011). In the present study, Cronbach’s alpha was found 0.77, which confirms reliability of the questionnaire.

In the present study, reliability of the questionnaire was confirmed with ICC of 0.81. Javadifar reported ICC of 0.83 (Javadifar, 2012). Ma et al. believe that correlation higher than 0.75 shows good consistency, between 0.5 and 0.75 shows moderate consistency, and less than 0.5 shows poor consistency (Ma, Yam, Tsui, & Yau, 2006). According to Polit & Beck, 0.7 is acceptable correlation coefficient for the whole scale and higher than 0.4 is acceptable for subscales (Polit & Beck, 2008). Hence, reliability coefficients found for the questionnaire in the present study agrees with those in statistics literature and other studies. Burns and Grove consider two weeks to one month an appropriate interval between two tests (Burns & Grove, 2008).

Barnes & Adamson-Macedo used retest method with 10 days interval to determine external consistency of “Perceive Maternal Parenting Self-Efficacy”. Spearman’s correlation coefficient showed a good correlation between these times ( $r=0.96$ ,  $P<0.01$ ) (Barnes & Adamson-Macedo, 2007).

In a study by Javadifar, ICC was found 0.833 with two weeks interval. In Matthey study, reliability of the tool used in a test-retest on 47 mothers was reported 0.52 at 6 weeks interval and 0.74 at 2-3 weeks interval (Matthey, 2011). In the present study, a 3-day interval was considered to avoid sample loss.

## 5. Conclusion

In the present study, maternal role adaptation scale in mothers with preterm neonates admitted in neonatal intensive care units (MRAS: NICU) was developed and adapted for Iranian culture. With features such as development based on understanding the concept of maternal role in mothers with preterm neonates through use of in-depth and qualitative research and review of literature, simple scoring, favorable reliability and validity and application by health service providers including nurses, the scale developed can be used for screening and assessment of maternal role adaptation in mothers with preterm neonates.

## 6. Limitations

The first limitation is that researchers used purposive sampling for the first stage of the study. Furthermore, in the present study, participants were from one particular geographical location, which limits generalizability of results to populations with different cultures.

Study limitations included lack of concurrent assessment of validity. Thus, it is recommended that future studies consider this kind of validity. Another limitation is that we did not perform the confirmatory factor analysis for the last stage of validation because collecting the sample size for this part took a long time and researchers plan to perform it in future.

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## Competing Interests Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

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