

Mother–Child Interactions of Preterm Toddlers

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ABSTRACT

Introduction: We aimed to investigate the mother–toddler relationship in preterm toddlers.

Methods: The sample consisted of 18 mothers and their preterm toddlers (group 1) and 20 mothers and their fullterm toddlers (group 2). Anxiety and depressive symptom levels, attachment pattern, and parental attitudes of mothers and social–emotional problems and developmental level of the toddlers were explored to assess possible confounding factors in the mother–toddler relationship. Two researchers rated the Parent Infant Relationship Global Assessment Scales (PIRGAS).

Results: Both the mothers in group 1 and group 2 had similar Beck Depression Inventory (BDI) and State and Trait Anxiety Inventory (STAI) scores. However, the mothers who gave birth before 32 weeks of gestation had higher trait anxiety scores than others (46 ± 2.4 vs. 42.3 ± 5.4 , $p=0.01$).

The groups had similar Brief Infant Toddler Social Emotional Assessment Scale (BITSEA) problem and competency scores. The parenting style of group 1 revealed that they had higher scores on the Parenting Attitude Research Instrument (PARI) subscale 5 (excessive discipline) (39.6 vs. 32.1; $p=0.02$).

Conclusion: Mother–toddler interaction and attachment security were found to be similar in fullterm and moderately preterm healthy toddlers. Our findings suggest that not the preterm birth itself but the medical, developmental, and/or neurological consequences of prematurity may affect the mother–toddler interaction. To explore the independent effect of prematurity in mother–toddler dyadic relationship, longitudinally designed studies are warranted.

Keywords: Preterm, attachment, toddler psychiatry, maternal depression and anxiety

INTRODUCTION

For assessing the risk of clinically significant child problem behavior in the 0–2 age group, greater emphasis has been placed on parenting and factors that may compromise parental functioning as well as factors that may compromise the developing brain, such as prematurity (1). Previously, it has been concluded that the quality of the early mother–premature infant interaction is predominantly associated with premature delivery and the level of prenatal maternal preoccupation and the quality of attachment (2). Recently, the findings support the associations between emotional/behavioral difficulties and maternal stress in pregnancy and the prematurity/low birthweight and risk for subsequent depression (3).

A lot of research has been conducted on the future welfare of infants whose births were complicated by prematurity. As the premature birth potentially has a traumatic impact, parents often show stress reactions (4). The psychological distress of the parents of preterm infants is reported to alter early interactions between parent–child couples and cause problems with the biosocial rhythm (5). On the other hand, premature birth may have secondary effects on child behavior by affecting parental attitudes and expectations and by distorting normal parent–child relationships (5). In other words, there are many confounding factors that could affect the association between premature birth and mother–toddler interactions.

Prematurity represents a unique constellation of biological and psychosocial risk factors. The studies conducted by Ammaniti suggested that compared with normal birth, after premature birth, there may be a huge discrepancy between the mother's imagination and fantasies of her child and the premature infant born with problems (6). Admission to the Neonatal Intensive Care Unit (NICU) is always a negative event for the family. Separation from the baby, fear of death and disability of the baby, and maternal fear about inability to take care of the baby cause significant distress on the parents. The mothers of the infants who were admitted to NICU were found to have higher postnatal depression scores on the Edinburgh Postnatal Depression Scale (EPDS) than the parents of healthy infants. In addition, the mothers with higher EPDS scores had higher anxiety scores and displayed rather insecure attachment styles than those with lower EPDS scores (7,8).



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In a previous study, when the child was 3 and 12 months old, both parents of 54 term infants and 49 preterm infants were individually examined while they were interacting with their infant in home settings during a structured task (the Nursing Child Assessment Teaching Scale). The mother and fathers of preterm infants had lower interaction scores than parents of term infants (9). Another study studied premature (n: 16) and fullterm infants (n: 17) and their mothers at 6, 8, 10 and 14 months of corrected age (10). In that study, the authors reported that premature infants had less vocalization and played less. In addition, the compared with fullterm infants, mothers of premature infants demonstrated more caretaking and affectionate behavior toward their infants. On the other hand, another study addressed the relation between perinatal risk status and infants' attachment relationship with their parents (11). They observed 30 fullterm and 30 very-low-birthweight preterm infants in the Strange Situation at 13 and 20 months. They did not find any evidence that birth status (preterm, fullterm) influenced infants' attachment relationships with their parents.

Attachment can be defined as a behavioral pattern that shows emotional connection established between a child and primary caregiver in the first year of life. The attachment pattern has a great impact on human development, and it reflects the reciprocal relationship of children and parents. The attachment function has a complementary effect that ensures the child's safety by establishing proximity to the caregiver if stressful and/or dangerous events occur while the child is trying to explore the environment (12). Bowlby and Ainsworth developed the attachment theory to explain the development of affectional bonds in infancy. These bonds may be translated into romantic love in adulthood. They theorize that a person's attachment style may be mostly determined by childhood relationships with parents (13). Previous studies have revealed that there are three attachment styles [secure; insecure (avoidant or anxious/ambivalent)] and that these styles are roughly the same in adulthood as in infancy. These three different patterns of attachment style may affect the adult differently in terms of the experience of romantic love. In addition, the authors concluded that the attachment style is related to mental models of self concept and social relationships (13). Previous studies indicate that the insecure attachment styles are particularly believed to correlate with later psychopathology, while secure attachments may predict a better psychological profile (14,15).

Maternal attachment style is found to be associated with the toddlers' development and psychopathology. In a recent study (16), results indicate that maternal insecure attachment style is significantly associated with the severity of the emotional and behavioral problems of toddlers, such as hyperactivity and irritability. In an earlier meta-analysis, it was shown that the mothers with secure attachment styles had the caregiving behaviors of being warm, responsive, and more positive (17). Among 47 preterm (GA<34 weeks) and 25 fullterm infants, another study explored the associations between maternal posttraumatic stress and maternal attachment representations of the infant and mother–infant dyadic interactions at 6 months of corrected age (18). They reported that the fullterm mothers had more "Cooperative" dyadic pattern of interaction and demonstrated Balanced representations of the infant. On the other hand, preterm mothers were more likely to follow a "Controlling" dyadic pattern of interaction, with more Distorted or Disengaged representations.

Puerperal depressive rates have been reported to be as high as 40% in some samples (19). Previous studies have demonstrated insecure attachment cognitions to be associated with depression (16,20), and other studies have found relations between mother's insecure attachment and puerperal depression (21,22). On the other hand, the children of depressed mothers are at risk of emotional distress (23,24,25).

The confounding effect of parental anxiety in addition to parental depression should be taken into account because depression can be interrelated with anxiety in a similar manner as depression and attachment style are interrelated. In addition, another interrelated factor with mother–toddler relation may be toddlers' attachment style.

In the present study, we aimed to investigate the mother–toddler relationship in preterm toddlers and determine the patterns of attachment. In addition, we analyzed the association between several factors, including parenting style, depressive and anxiety symptoms, and attachment style of the mothers and attachment style and social and emotional problems of the toddlers. Compared with the fullterm group, we hypothesized that the preterm group would have a more "distressed or perturbed mother–toddler relationship" and that preterm toddlers would have a more insecure attachment style.

METHODS

Participants and Study Design

The preterm toddlers were recruited from neonatal unit files of a pediatrics clinic, and fullterm participants were recruited from the pediatrics out-patient unit of Marmara University hospital. The Institutional Review Board approved the protocol of this study. Informed parental consent was obtained for all children before their inclusion in the study. Toddlers with chronic medical problems and with abnormal neurologic examination were excluded. All toddlers had the Bayley Scales of Infant Development. First, 20 preterm and 20 fullterm toddlers were recruited into the study. Following this, to rule out the possible confounding effects of mental developmental problems into the relation between preterm birth itself and mother–toddler interaction, two preterm toddlers who had Bayley mental development score less than 65 were excluded from further analysis. Finally, 18 mothers and their preterm toddlers (group 1) were compared with 20 mothers and their fullterm toddlers (group 2) at a mean age of 16.7 ± 3.9 months. The mean gestational age and birth weight of the preterm toddlers were 32 ± 2.1 weeks and 1832 ± 498 g, respectively, and the mean duration of hospital stay was 20 days. The demographic features of the preterm and fullterm groups are presented in Table 1.

To use Parent Infant Relationship Global Assessment Scales (PIRGAS) measurement and to examine the attachment pattern of the toddler, we applied a semi-structured examination procedure. This mother–toddler relationship examination procedure included two sections and five subdivisions, which are partly similar to The Crowell Observation and/or The Ainsworth's Strange Situation. Section One includes three subdivisions, "Free Play," "Tidy up," and "Questionnaire," and Section Two includes two subdivisions, "Structured Play" and "Separation-Reunion." The attachment pattern of the toddler is examined via this procedure and grouped as "secure" or "insecure" (avoidant and/or anxious).

Maternal depressive symptoms were screened by Beck Depression Score, and maternal anxiety was assessed with the State and Trait Anxiety Inventory. The Adult Attachment Scale was used to determine the attachment style of the mother. The toddler problems and competences were rated by the Brief Infant Toddler Social Emotional Assessment Scale (BITSEA). Parenting styles were determined by the Parenting Attitude Research Instrument (PARI). Mothers and their toddlers were videotaped in a standardized object play interaction situation. PIRGAS were rated by two researchers. If the PIRGAS score is less than 80, this was defined as a distressed or perturbed interaction. Informed consent was obtained from all mothers, and approval was obtained from the local ethics committee of Marmara University Hospital.

Table 1. Demographic features of the preterm and fullterm groups

	Preterm (n: 18)	Fullterm (n: 20)	p
Birth weight (g)	1832±498	3384±323	0.0001^a
Birth week of gestation	32±2.1	38.5±1.8	0.0001^a
Delivery method (C/S) (n) (%)	15	14	0.4 ^b
Gender (male/female) (n)	8/10	11/9	0.7 ^b
Maternal age	33.6±4.5	32.4±6.1	0.5 ^a
Maternal education (>8 years) (%)	12 (67%)	18 (90%)	0.05 ^b
Paternal age	36.5±4.3	35.4±4.4	0.4 ^a
Paternal education (>8 years) (%)	15 (83%)	19 (95%)	0.1 ^b
Being first born (n) (%)	8 (44%)	11 (55%)	0.5 ^b
Breast feeding duration (months)	9±4	15±3	0.01^a
Current age (months)	16.7±3.9	16.9±4.4	0.9 ^a
Current weight (g)	10732±924	11087±1807	0.4 ^a
Bayley mental score	94.8±8.8	99.9±13.5	0.1 ^a
Bayley motor score	99.6±14.2	99±13.6	0.8 ^a

Superscript a indicates Mann–Whitney U tests. Superscript b indicates chi-square tests. Bolds indicate statistical significance.

Instruments for Mothers

The Beck Depression Inventory (BDI): BDI contains 21 items that describe various symptoms in parents occurring over the course of the past week. Each item is scored on a 0–3 scale (0=no depressive symptom, 3=a strong symptom) (26). Reliability and validity of the Turkish translation of BDI are quite adequate (27).

The State-Trait Anxiety Inventory (STAI): STAI is composed of two scales: one measures state and the other measures trait anxiety (28). Each scale contains 20 items that describe various anxiety symptoms. Each item is scored on a 1–4 scale. The reliability and validity of the Turkish translation of STAI were confirmed by Öner & Le Compte, and it has been commonly used in studies for evaluating the severity of anxiety (29).

The Parental Attitude Research Instrument (PARI): Schaffer and Bell (30) developed PARI, and Küçük (31) made the Turkish translation and performed the validation of PARI. It is a widely used instrument to assess child rearing characteristics of parents. It is composed of five factors: (1) excessive mothering, (2) democratic attitudes, (3) hostility and rejection, (4) discord between parents, and (5) authoritarian control.

The Adult Attachment Scale (AAS): Collins and Read (32) developed AAS on the basis of Hazan and Shaver's (13) Attachment Style Measure. It is a Likert-type self-report scale, and it assesses three adult attachment styles (secure, avoidant, and anxious/ambivalent). The avoidant and anxious/ambivalent styles are grouped as insecure attachment style. These three types of adults predictably differ in the manner in which they experience romantic love (13). AAS was translated into Turkish and validated by Alp (33).

Instruments for Toddlers

The Brief-Infant and Toddler Social-Emotional Assessment Scale (BITSEA): The BITSEA-Problem scale (BITSEA/P) comprises 31 items, and the BITSEA-Competence scale (BITSEA/C) comprises 11 items (34). Higher total scores on BITSEA/P indicate a higher level of behavioral and emotional problems, whereas lower total scores on BITSEA/C

indicate a lower level of competence. The reliability and validity of the Turkish version of BITSEA were confirmed, and a clinical validity study was conducted (35,36).

The Bayley Scale of Infant Development (BSID): BSID is composed of three distinct scales that measure mental acuities and abilities (Mental Scale), degree of control of body coordination and fine motor skills (Psychomotor Scale), and the child's social and objective orientation to the environment (Infant Behavior Record) (37). BSID has been used since 1958 and remains one of the most accurate and sensitive means to measure infant development.

Instruments for the Relationship between Mothers and Toddlers

PIRGAS: It is a global assessment scale of parent-infant relation. The Axis II diagnosis (relationship disorder) [Diagnostic classification: 0–3R (DC:0-3R)] was based on the clinical global impression of the disturbances in the mother–child interactions (38). It is labeled as “distressed or perturbed relationship” when the PIRGAS scores are between 40 and 79 and labeled as “disturbed relationship” when the score is 40 or less on PIRGAS. Two raters, who were not informed about the birth group of the participants, independently rated PIRGAS on the basis of a structured videotaping of the parent–toddler interaction.

Statistical Analysis

The distributions of the variables were examined for normality, and non-parametric statistics were used where the scores were not normally distributed. Correlations between the BDI, STAI, PARI, AAS, Bayley Scales, and BITSEA were calculated with the parametric (Pearson's correlation) or nonparametric tests (Spearman's correlation) depending on the normality of the variables. Statistical differences between groups were assessed using chi-square tests for categorical variables and t-tests or Mann–Whitney U tests for continuous variables. Because multiple calculations may increase the possibility of finding a significant difference by chance, we applied Bonferroni corrections where needed [e.g., PARI has five subscores, $p < 0.01$ (0.05/5) is accepted as significant]. All values are reported as either percentages or means±standard deviation. Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) 11.0 was used for all statistical calculations.

RESULTS

The psychological profile of mothers, mother–toddler relationship, and attachment style of toddlers are presented in Table 2.

The results did not reveal significant differences between the groups in terms of maternal depression, anxiety, and attachment scores. However, in further analysis, mothers who gave birth before 32 weeks of gestation had higher trait anxiety scores (46 vs. 42.3, $p = 0.01$). In addition, there were no significant differences between the groups in terms of toddlers' behavior problems (BITSEA problem) and rates of attachment security (Table 2). The parental attitudes (PARI) and global assessment of the mother–toddler relation (PIRGAS) did not show differences between the groups (Table 2). When both preterm and term groups were assessed together and grouped as “disturbed” and “nondisturbed” in terms of mother–toddler relationship on the basis of PIRGAS scores, only the maternal attachment security and toddlers' Bayley mental scores revealed significant differences between the groups (Table 3). As expected, the rate of insecure attachment of mothers was found to be significantly higher in the “disturbed” mother–toddler relation group. In addition, the toddlers in the “nondisturbed” group had higher scores in Bayley mental tests.

Finally, when the whole study groups were assessed together and grouped as “secure” and “insecure” in terms of toddlers' attachment, only the PIR- 159

Table 2. The psychological profile of mothers, mother–toddler relationship, and attachment style of toddlers

	Preterm (n: 18)	Control (n: 20)	p
BDI scores	9.3±8.4	7.7±7.6	0.6 ^a
State anxiety scores [†]	45.1±3.9	44.3±3.5	0.5 ^a
Trait anxiety scores [†]	44.5±5.9	42.2±3.6	0.1 ^a
BITSEA-problem	12.5±6.2	13±6.6	0.8 ^a
BITSEA-competence	16.8±3.1	15.7±3.8	0.3 ^a
Maternal attachment (secure) (n) (%)	14/18 (78%)	12/20 (60%)	0.2 ^b
PARI-1	36.3±8.9	31.6±8.2	0.1 ^a
PARI-2	20.9±3.8	20.4±5.4	0.7 ^a
PARI-3	30.7±9.2	29.1±7.3	0.5 ^a
PARI-4	16.2±2.6	14.8±3.4	0.1 ^a
PARI-5	39.6±10.4	32.1±9.3	0.02 ^a
PIRGAS (Rater 1)	77.3±15.2	80.5±13.8	0.5 ^a
PIRGAS (Rater 2)	73.6±19.9	76.8±13	0.5 ^a
PIRGAS (Rater 1) disturbed (n) (%)	7 (39%)	7 (35%)	1 ^b
PIRGAS (Rater 2) disturbed (n) (%)	7 (39%)	7 (35%)	1 ^b
Toddler's attachment (Rater 1) insecure (n) (%)	4 (22%)	8 (40%)	0.3 ^b
Toddler's attachment (Rater 2) insecure (n) (%)	6 (33%)	8 (40%)	0.7 ^b

Superscript a indicates Mann–Whitney U tests. Superscript b indicates chi-square tests. [†]indicates State-Trait Anxiety Inventory. BDI: Beck Depression Inventory; BITSEA: Brief-Infant and Toddler Social-Emotional Assessment Scale; PARI: Parental Attitude Research Instrument; PARI-1: excessive mothering; PARI-2: democratic attitudes; PARI-3: hostility and rejection; PARI-4: discord between parents; PARI-5: authoritarian control; PIRGAS: Parent-Infant Relation-Global Assessment Scale

GAS scores revealed significant differences between the groups (Table 4). As expected, the securely attached toddlers had better scores in PIRGAS.

DISCUSSION

In the present study, we investigated the mother–toddler relationship in preterm and fullterm toddlers and analyzed the association between several factors, including parenting style, depressive and anxiety symptoms, attachment style of the mothers, and attachment style and social and emotional problems of the toddlers. This is one of few studies conducted in Turkey exploring this topic. The overall results of the study suggest that compared with fullterm peers at 16 months of age, similar patterns of mother–toddler relationship, in terms of attachment, responding, and others, could be achieved in moderately preterm toddlers without any chronic problems and normal neurodevelopment. Mean PIRGAS scores and rates of secure attachment pattern were comparable between preterm and fullterm toddlers.

On the other hand, the results revealed that mothers who gave birth before 32 weeks of gestation had higher trait anxiety scores at 16 months after delivery. Toddlers with secure attachment pattern had higher PIRGAS scores. In addition, toddlers with a better mother–toddler interaction, as indicated by high PIRGAS scores, had higher Bayley mental scores.

Uncertainty exists as to how the level of anxiety may affect patterns of mother–infant interactions. Maternal anxiety could lead to overprotectiveness or later psychosocial pathology. There are only few studies in-

Table 3. The mean scores of several instruments of mother and toddler couples with disturbed and nondisturbed relationships in Parent-Infant Relation- Global Assessment Scale (PIRGAS)

	Disturbed	Non-disturbed	p
Maternal BDI	6.7±5.5	9.4±9.2	0.2 ^a
Maternal state anxiety [†]	45±4.7	44.7±2.8	0.8 ^a
Maternal trait anxiety [†]	44±4.6	43.1±5.3	0.6 ^a
BITSEA-problem	12.4±4.7	13.1±7.4	0.7 ^a
BITSEA-competence	14.8±4.2	17.1±2.8	0.08 ^a
Maternal Attachment (secure) (n) (%)	6/14 (43%)	20/23 (87%)	0.007^b
PARI-1	33.5±9.9	33.9±8.4	0.8 ^a
PARI-2	21.6±3.8	20.2±5.2	0.3 ^a
PARI-3	29.8±7.6	30±8.8	0.9 ^a
PARI-4	15.4±2.4	15.5±3.4	0.9 ^a
PARI-5	36.9±8.8	34.9±11.7	0.5 ^a
Birth weight (g)	2588±747	2642±970	0.8 ^a
Birth Week of gestation	35.4±3.3	35.3±4.3	0.9 ^a
Bayley mental score	90±9.3	100.9±10.8	0.004^a
Bayley motor score	97.2±14.3	99.5±13	0.6 ^a

Superscript a indicates Mann–Whitney U tests. Superscript b indicates chi-square tests. [†]indicates State-Trait Anxiety Inventory. Bolds: indicate statistical significance. BDI: Beck Depression Inventory; BITSEA: Brief-Infant and Toddler Social-Emotional Assessment Scale; PARI: Parental Attitude Research Instrument; PARI-1: excessive mothering; PARI-2: democratic attitudes; PARI-3: hostility and rejection; PARI-4: discord between parents; PARI-5: authoritarian control; PIRGAS: Parent-Infant Relation-Global Assessment Scale

vestigating the relationship between anxiety and quality of parent–child interaction (39,40,41). The results of these studies are inconsistent with regard to whether parental anxiety influences the relationship adversely. Anxious mothers may stimulate their infants more actively and intrusively and tend to be less sensitive to infants' cues (39,40,41). The purpose of the present study was to explore the contribution of maternal depressive and anxiety symptoms and maternal representation of attachment relationship to toddler attachment in a sample of healthy preterm toddlers. Beck depression scores of mothers of preterm and term toddlers were not different at a mean of 16 months after delivery. On the other hand, interestingly, mothers who gave birth before 32 weeks of gestation had higher anxiety scores.

The early mother–child relationship includes both actions and representations (39). Keren et al. (40) found that the mothers with positive representations had more optimal interactions with their premature infant at NICU than the mothers with negative representations. Similarly, infant's interactive behavior, in terms of the amount of withdrawal behavior, was predicted by negative maternal representations. Mothers of high-risk preterm infants had lower readiness for motherhood (40). A number of studies have shown that parents experienced and remembered the birth of a preterm infant as extremely stressful, in particular, because of the uncertainty about the infant's survival and the fear that their development will be impaired or at least delayed, in addition to other anxieties (7,8,41). Studies have shown that adults have more negative views about their infants and they behave in less desirable ways toward the infants who are born prematurely in comparison with fullterm infants (41,42). The mothers of 3-year-old healthy children who had been born prematurely showed much greater levels of perceived child vulnerability than those of

Table 4. The mean scores of several instruments of mother and toddler couples with securely or insecurely attached toddlers

	Secure	Insecure	p
Maternal BDI	8.2±8.9	9.2±5.7	0.6 ^a
Maternal state anxiety [†]	45.2±3.5	43.7± 3.9	0.3 ^a
Maternal trait anxiety [†]	43.5±5.4	42.9±3.9	0.7 ^a
BITSEA-problem	13.7±7.1	10.7±3.9	0.09 ^a
BITSEA-competence	16.8±2.8	14.9±4.4	0.2 ^a
PIRGAS	83.7±11.2	67.7±15.4	0.007^a
PARI-1	35.6±8.9	30±7.2	0.05 ^a
PARI-2	20.7±4.8	20.6±4.6	0.9 ^a
PARI-3	31±8.5	27.2±7.2	0.1 ^a
PARI-4	15.8±3.2	15±2.9	0.4 ^a
PARI-5	37.2±11.6	32.6±6.6	0.1 ^a
Birth weight (g)	2544±936	2875±749	0.2 ^a
Birth Week of gestation	34.9±3.9	36.2±3.5	0.3 ^a
Bayley mental score	99.3±11.4	93.4±11.5	0.1 ^a
Bayley motor score	98±10.8	99.5±11.2	0.8 ^a

Superscript a indicates Mann–Whitney U tests. [†]indicates State-Trait Anxiety Inventory. Bold: indicates statistical significance. BDI: Beck Depression Inventory; BITSEA: Brief-Infant and Toddler Social-Emotional Assessment Scale; PARI: Parental Attitude Research Instrument; PARI-1: excessive mothering; PARI-2: democratic attitudes; PARI-3: hostility and rejection; PARI-4: discord between parents; PARI-5: authoritarian control; PIRGAS: Parent-Infant Relation-Global Assessment Scale

children who had been born fullterm (43).

Mothers of healthy prematurely born toddlers were more controlling than those of fullterm toddlers. Among mother–preterm infant dyads, Forcada-Guex et al. (44) identified two specific patterns of interaction. One could have a protective (cooperative) pattern. The other may have a risk-precipitating (controlling) pattern. These patterns have a role in the developmental and behavioral outcome, independent of the perinatal risk factors. The controlling pattern was much more prevalent among preterm than term dyads and was related to a less favorable infant outcome (18,44).

Because of the possibility that prematurity stereotyping can lead to undesirable outcomes in premature infants, interventions emphasizing the similarities between premature and fullterm infants can be recommended. However, social and attention problems are more common in preterm infants, particularly if they have pediatrician assessed developmental delays (45). In our study, the infant problems and competences were rated with BITSEA, and these scores were not significantly different between study and control groups.

Despite the fact that a preterm birth, particularly when combined with life-threatening events, may increase maternal anxiety, uncertainty exists in terms of how the level of anxiety may affect patterns of mother–infant interactions. Increased anxiety levels may influence maternal attitudes, and mothers may be more controlling toward their infants. In accordance with this assumption, in our study, authoritarian control subscale scores of PARI were found to be significantly higher in the preterm toddler group. On the other hand, excessive mothering scores were significantly higher in the control group. This finding awaits further investigation.

Yurdakul et al. (8) have reported that EPDS scores of mothers whose offspring was hospitalized in NICU were significantly higher than the control group. They reported that 29.5% of the mothers of infants in NICU

and 13.6% of mothers of infants in the control group had high depressive scores. Similarly, Carter et al. (7) have reported that a higher percentage of parents with infants in NICU had clinically relevant anxiety.

Toddler development is a dynamic unfolding of biological potential within a continuously evolving environmental context, the most important of which is provided by parents or primary caregivers (46). A fruitful infant–mother relationship may have a positive influence on child development. Accordingly, our results show that infants with higher PIRGAS scores have significantly higher Bayley mental development scores. Similarly, as expected, securely attached infants have higher PIRGAS scores.

Previous findings indicate that preterm infants are less readily engaged in social play and show less positive affect (47). In addition, mothers of preterm infants have been noted to be more intrusive and more insensitive than mothers of fullterms, although such maternal behaviors may be attempts to compensate for the less responsive behavior of infants. Therefore, preterm infants may be at greater risk for developing insecure patterns of attachment (47). However, the results of the studies on security of attachment in preterm infants have been equivocal. The preterm infants with the greatest medical risks are most likely to develop insecure attachment to their mothers. A study examined the development of attachment in very-low-birthweight preterm infants with respect to neurological development. They included the mothers with attachment representations in a high-risk sample of very-low-birthweight preterm infants ($\leq 1,500$ g) (47). The distribution of the quality of attachment in preterm infants was comparable with results of studies of term infants. However, the infants with neurological impairment were found to be insecurely attached more often than securely attached (48). It is not the prematurity per se but rather the level of the neonatal risk status associated with preterm birth that may be related to the quality of the infants' attachment to the mother (16). Therefore, in our study, we only included preterm infants who did not have any chronic problems and had normal neurological examination. We excluded two preterm infants with Bayley mental scores less than 65 as a result of our analysis. In our study, the study and control groups were not different in terms of the rate of attachment security.

As a limitation, the attachment styles of parents were not assessed with clinical interviews. On the other hand, chi-square comparisons are not particularly robust methods of assessing differences between groups, and it would be better to compute more sophisticated analyses such as regression models. Recruiting a specialized sample as this is quite difficult and the sample size was limited. In addition, there were high numbers of variables. These conditions complicated the evaluation of the results and made it difficult to compute reliable power analysis.

In conclusion, premature birth predisposes newborns to many biological and psychosocial risk factors. It is known that parents of premature infants have high anxiety and depressive scores during intensive care stay. In the present study, we found that mothers of preterm toddlers born before 32 weeks of gestation continued to have higher anxiety scores more than 1 year after delivery. However, mother–toddler interaction and attachment security were similar in fullterm and moderately preterm healthy infants. Because attachment theory addresses specific aspects of the mother–toddler relationship, future research should explore the hypothesis that maternal insecure attachment is associated with specific caregiving behaviors such as lack of empathy or poor caregiving in interactions with their children. Our findings suggest that not the preterm birth itself but the medical, developmental, and/or neurological consequences of prematurity affect the mother–toddler interaction. To significantly explore the independent effect of prematurity in this relationship, longitudinally designed studies are warranted.

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