# The Maternal (Non) Responsiveness Questionnaire: Initial Factor Structure and Validation

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## Abstract:

The purpose of this paper was to examine the reliability, stability, and convergent and predictive validity of the newly developed Maternal Responsiveness Questionnaire (MRQ). Participants were 224 first-time mothers. Mothers completed the MRQ when their infants were 6 and 14 months old. Convergent validity was examined in relation to mother-reported personality, depressive symptoms, and emotion socialization practices and observed maternal sensitivity. Predictive validity was examined in relation to mother-reported child behaviour problems and social competence, infant attachment security assessed via the Strange Situation, and observed child dysregulation. Three MRQ factors emerged based on exploratory factor analysis and were confirmed via confirmatory factor analysis: responsiveness, non-responsiveness, and delayed responsiveness. All three scales demonstrated good internal consistency reliability and significant stability from 6 months to 14 months. Consistent evidence emerged for convergent and predictive validity of the non-responsiveness subscale, but not the other subscales. The potential utility of the non-responsiveness subscale of the MRQ is discussed.

**Keywords:** maternal responsiveness | self-report | infant crying

## Article:

Maternal responsiveness to infant cues, particularly distress cues, during the first year of life is crucial in forming a secure mother–infant attachment relationship, providing infants with opportunities to learn to self-regulate, and preventing the onset of behaviour problems (Leerkes, Weaver, & O'Brien, 2012). In most studies, maternal responsiveness is observed, but this has limitations. First, it is difficult to conduct observations in large-scale, multi-site studies given the time and expense (Lunkenheimer & Leerkes, 2015). Second, the extent to which infants become distressed varies, and is quite low in typical, brief observational tasks that are not designed to elicit distress, undermining the ability to rate maternal responsiveness to distress for some dyads (Leerkes, Blankson, & O'Brien, 2009). Thus, a valid, brief self-report measure of responsiveness

may be a useful complement to observational measures, but to our knowledge no such measure exists. The goal of this study is to examine the reliability, convergent validity, and predictive validity of a newly-developed self-report measure of maternal responsiveness.

We define responsiveness as the promptness with which mothers respond to infant signals. Prompt responding to infant signals is generally considered adaptive as it efficiently terminates infants' crying, and non-responsiveness is associated with infants' increased frequency of crying over time (Bell & Ainsworth, 1972; Crockenberg & Smith, 1982). Additionally, non-responsiveness during the early months predicts attachment insecurity at 1 year (Ainsworth, Blehar, Waters, & Wall, 1978; Crockenberg, 1981). The results of more recent research, however, suggest that moderate levels of delayed responding to infants' crying, particularly mild fussing, may be adaptive in relation to subsequent distress and attachment security because it provides infants with opportunities to practice self-regulatory abilities (van IJzendoorn & Hubbard, 2000). Consistent with this view, moderate contingency between infant cues and maternal responsiveness is linked with more adaptive outcomes than either high or low contingencies (Jaffe, Beebe, Feldstein, Crown, & Jasnow, 2001), and moderate, but not high, levels of mothers' contingent responding to infant behaviour was positively associated with global ratings of maternal sensitivity (Bornstein & Manian, 2013). As a set, these studies suggest that complete non-responsiveness may be maladaptive while mild delays in responding may not.

We created the Maternal Responsiveness Questionnaire (MRQ) in an effort to assess the extent to which mothers engage in prompt responding, somewhat delayed responding, and non-responsiveness. In this manuscript, we examine the factor structures of MRQ using exploratory factor analysis on maternal reports on the MRQ when their infants were 6 months old and then confirmatory factor analysis on their reports when their infants were 14 months old. Then, we present the internal consistency reliability for each subscale and the extent to which they are stable from 6 months to 14 months postpartum. Given that observed parenting (Dallaire & Weinraub, 2005; NICHD Early Child Care Research Network, 1999) and self-reports of parenting are generally stable over time (Verhoeven, Junger, van Aken, Deković, & van Aken, 2007), we anticipated a similar stable pattern for self-reported parenting.

Next, we assess the convergent validity of the MRQ by examining the association between MRQ scales and maternal characteristics linked with parenting behaviour, observed maternal sensitivity, and maternal reported emotion socialization practices. Drawing from prior research, we anticipated that high maternal neuroticism and depressive symptoms and low agreeableness would be associated with higher non-responsiveness and lower responsiveness and delayed responsiveness (Belsky & Jaffe, 2006). Likewise, we anticipated that non-responsiveness would be negatively associated with observed sensitivity, whereas responsiveness and delayed responsiveness would be modestly positively associated with observed sensitivity (Bornstein & Manian, 2013). We also examine convergent validity with another self-report of parenting which focuses on specific ways mothers respond when their toddlers are upset. Drawing from prior research, we predict that maternal responsiveness and delayed responsiveness would correlate positively with supportive emotion socialization but negatively with punitive and minimizing emotion socialization (LeCuyer-Maus, 2000; Spinrad et al., 2007), whereas the opposite pattern of associations would be apparent for non-responsiveness.

Finally, we examine the predictive validity of MRQ scales by assessing the association between MRQ scales and infant outcomes. Consistent with prior research (Landry, Smith, & Swank, 2006), we expected that maternal responsiveness would be associated with more competence and less problem behaviour as reported by mothers at both 1 year and 2 years of age, whereas we expected the opposite pattern for non-responsiveness. In addition, we consider two observed child outcome measures: infant–mother attachment assessed via the Strange Situation at 14 months of age and children's observed distress, a behavioural measure of emotion dysregulation, during a challenging clean up task when children were 2 years old. Based on prior research, we anticipated that mothers of secure infants would be higher on responsiveness and delayed responsiveness than mothers of insecure infants (Crockenberg, 1981; Higley & Dozier, 2009; van IJzendoorn & Hubbard, 2000), and mothers of avoidant infants would score higher on non-responsiveness than other mothers (Ainsworth et al., 1978; Goldberg, MacKay-Soroka, & Rochester, 1994). Finally, we anticipated that maternal responsiveness and delayed responsiveness would predict less negative affect in children, and the opposite pattern would be apparent for children of mothers who report more non-responsiveness (Crockenberg & Smith, 1982; Leerkes et al., 2009; van IJzendoorn & Hubbard, 2000).

**Method**

Participants

Participants in the current study were drawn from a prospective longitudinal study investigating the origins of maternal sensitivity during infancy. The initial sample consisted of 259 primiparous mothers (128 European American, 131 African American) and their infants. At recruitment, participants ranged in age from 18 to 44 years ($M = 25$ years). Twenty-seven percent of the participants had a high school degree or less, 27% had some college, and 46% had a 4-year college degree or beyond. Most (71%) mothers were married or living with their child's father, 11% were dating but not living with their child's father, and 18% were single or not living with the child's father. Annual family income ranged from less than $2000 to over $100 000; median income was $35 000. The analytic sample for this report includes 224 mothers who completed the MRQ at 6 months postpartum. Of these, 211 participated in the observation of maternal sensitivity at 6 months and 207 at 1 year; 224 completed the MRQ at 1 year; 221 reported on child outcomes at 1 year and 209 at 2 years, and 189 participated in the clean-up task at 2 years. Thus, the *n* ranged from 189 to 224 across analyses. Mothers who did not complete the MRQ at 6 months did not differ from mothers who did on age, education, family income, or marital status.

Procedure

Expectant mothers were recruited during their third trimester from childbirth education classes, breastfeeding classes, obstetric practices, and via word of mouth. Mothers completed a demographic questionnaire and personality measure during the prenatal period. Mothers and infants came to the campus observation room when their infants were approximately 6 months, 14 months (referred to as 1 year), and 27 months old (referred to as 2 year). Prior to these visits, mothers were mailed questionnaires, which they returned during the visit. Mothers and infants were videotaped during interactive tasks described below. At the conclusion of each data

collection wave, mothers were compensated $50 to $100, and children received a small gift at each visit. All procedures were approved by the university's institutional review board.

Measures

**The Maternal Responsiveness Questionnaire (6 M and 1 Y)**

The MRQ was developed after reviewing Crockenberg and Smith's (1982) measure which focused on beliefs about spoiling and following routines/schedules (5 items) and on responsiveness to crying, ranging from immediately to 15 min, in three specific situations (nighttime, when put down for a nap, crying when well fed). We designed the MRQ to focus solely on self-reported past *behaviour and not beliefs or attitudes*. In addition, we expanded the number of contexts considered and included more items in an attempt to get more precisely at response time (e.g. immediately, few seconds, few minutes, 10 or more minutes, not respond at all). This resulted in 68 items across seven specific contexts (8 to 15 items per context stem). Four distinct situations emphasizing the cause of infant crying were included: (i) crying because frustrated; (ii) crying because sick; (iii) crying because afraid; and (iv) crying for unknown reasons because mothers may respond differently to crying depending on the perceived cause/urgency of crying. Additionally, given widespread differences in professional advice and personal beliefs about how to respond to nighttime crying/waking (St James-Roberts, 2007), nighttime crying was included as an additional context, without specifying the cause. Finally, given the possibility that mothers' responsiveness may vary depending on whether or not they have concurrent competing demands (Rosenblum & Paully, 1984), two contexts that reflect this distinction were included (e.g. have a few free minutes to yourself to relax versus trying to do housework, pay the bills or make dinner). Although we were primarily interested in responsiveness to crying (49 items), items about other infant states (19 items) were included in the competing/non-competing demands contexts in an effort to minimize an obvious focus on crying (e.g. respond in a playful manner when your baby smiles or coos at you). Prior to administering the questionnaire, we sought and integrated feedback from three experts in parenting infants including Susan Crockenberg.

Mothers were asked to rate how likely they are to respond as described on a scale of 1 (*never*) to 5 (*always*). The instructions, seven context stems, and all items are available in the Appendix. Three subscales were originally theorized including: (i) *responsiveness* (e.g. respond to your child immediately; (ii) *non-responsiveness* (e.g. let your child cry for 10 or more minutes before responding; let your child cry until your child stops crying on his or her own no matter how long that takes); and (iii) *delayed responsiveness* (e.g. let your child cry for a few seconds while you quickly finish what you are doing).

**Maternal characteristics**

Mothers completed the NEO Five-Factor Inventory (Costa & McCrae, 1985/1992) prenatally to assess agreeableness (the sum of items reflecting being trusting, helpful, and forgiving; Cronbach's alpha = .79) and neuroticism (the sum of items reflecting being anxious, hostile, and depressed; Cronbach's alpha = .81). At 6 months and 1 year, mothers completed the Center for

Epidemiologic Studies–Depression Scale (Radloff, 1977) to assess depressive symptoms (Cronbach's alpha = .90 and .91 at 6 months and 1 year).

**Observed maternal sensitivity (6 M and 1 Y)**

Trained raters rated maternal sensitivity separately for each task (at 6 months: caregiving, free play, transition, arm restraint, novel toy approach, still-face procedure; at 1 year: free play, transition task, novel character, phone in jar) using Ainsworth's nine-point sensitivity scale from (1) highly insensitive to (9) highly sensitive (Ainsworth, Bell, & Stayton, 1974). Observational tasks are further described in Haltigan et al. (2014) and Leerkes, Su, Calkins, Supple, and O'Brien (2016). Fifteen percent of the videos were double-coded for reliability at each time point. Intraclass correlations were high, mean ICC = .87 at 6 months and .87 at 1 year. Two sensitivity composites were created; sensitivity to distress was calculated by averaging sensitivity ratings across distress-eliciting tasks (at 6 months: arm restraint, novel toy approach, the reunion episode of the still-face procedure; alpha = .85; at 1 year: novel character approach, phone in jar task; alpha = .77), and sensitivity to non-distress by averaging sensitivity ratings from the non-aversive tasks (at 6 months: caregiving, free play, transition, the engagement episode of the still-face procedure; alpha = .89; at 1 year: free play and transition tasks; alpha = .76).

**The coping with Toddler's negative emotions scale (CTNES, 1 Y)**

The CTNES assesses parents' responses to their toddlers' negative emotions by presenting parents with 12 hypothetical situations in which their toddler is upset (Spinrad et al., 2007). Parents rate the likelihood of responding to these scenarios in each of seven possible ways. An exemplar scenario stem is "If my child is going to spend the afternoon with a new baby sitter and becomes nervous and upset because I am leaving I would…". We focus on the five subscales that loaded on supportive and non-supportive responses in Spinrad et al. (2007). Following that approach, we averaged the mean scores from expressive encouragement, emotion-focused responses and problem-focused responses to yield a measure of supportive responses (alpha = .92), and averaged the means from punitive and minimizing subscales to yield a measure of non-supportive responses (alpha = .85). Higher scores indicate greater levels of a given reaction type.

**The strange situation procedure**

Infant–mother attachment security was assessed at 1 year of age using the Strange Situation Procedure (Ainsworth et al., 1978). The Strange Situation was administered according to standard procedures and the videotapes were coded by E. Carlson using the standard three-way classification system. In this sample, 168 children were secure, 16 avoidant, and 19 resistant. Thirty cases were double coded, and the intercoder reliability for the three-way classification was $k = .88$.

**Brief infant–toddler social and emotional assessment (1 and 2 Y)**

When infants were 1 and 2 years of age, mothers completed the 42-item Brief Infant–Toddler Social and Emotional Assessment (BITSEA; Briggs-Gowan & Carter, 2006). Thirty-one items assess problem behaviours reflecting externalizing, internalizing, and dysregulation and 11 items assess social–emotional competence. Items are scored on a three-point scale from 0 = Not True/Rarely to 2 = Very true/Often and are summed within domain. In the sample, the internal reliability was .85 and .81 for problem behaviours and .62 and .64 for competence at 1 and 2 years respectively.

**Child affect during clean-up task (2 Y)**

During the 2 year visit, mothers were told to play with their child as they normally would for 7 min using age appropriate toys. Then, the experimenter brought in two large storage containers and instructed the mothers to get their child to clean up all of the toys in any way they wanted, but they had to involve their child. The task ended when 5 min was over or when all of the toys were in the containers ($M = 4.30$ min, SD = 1.03 min). Child affect was continuously rated from digital media files using INTERACT 9 (Mangold, Arnstorf, Germany). A seven-point scale ranging from (1) high positive affect (open mouth, intense smile, can be laughing or squealing) to (7) high negative affect (screams, wails, sobs intensely; mouth wide), based on toddlers' vocalizations, facial expressions, and body tension, was applied. The percent of task time that infants expressed negative affect (a rating of 5, 6, or 7) was calculated. The majority of toddlers (67%) became distressed.

**Results**

The original 68 maternal responsiveness items administered at 6 months were subjected to an exploratory factor analysis using full-information maximum likelihood estimation with Oblimin rotation. We specified an oblique rotation method (Oblimin) which allowed the factors to correlate given that it was expected that the scales may be modestly associated with one another. Items loading at an absolute value .32 or higher were considered meaningful and retained as factor indicators. This model resulted in seven non-loading items and eight cross-loading items (i.e. items loading on more than one factor at an absolute value of .32 or higher). Non- and cross-loading items were removed. We than ran four additional EFAs (specifying a three-factor solution), sequentially deleting low and cross-loaders as noted above (cf. Brown, 2006; Floyd & Widaman, 1995) until non- or cross-loading items were no longer observed. This resulted in the deletion of three additional non-loaders and one additional cross-loader. The factor pattern rotated loadings for the final three-factor solution are presented in Appendix 1. There were no cross-loaders in the final solution and all 49 items loaded on their primary factor at an absolute value of .32 or higher, thus demonstrating excellent simple structure (Thurstone, 1947). The extracted factors accounted for 47.57% of the item variance.

The conceptual content of the three retained factors revealed the a priori dimensions of maternal responsiveness, non-responsiveness, and delayed responsiveness. Exemplar items from the responsive subscale (25 items) include "Mom busy, respond playfully if baby smiles or coos," and "Mom busy, make point of interacting with baby every few minutes." Exemplar items from the nonresponsive subscale (13 items) include "Mom busy, let baby cry for a few minutes while finishing," and "Baby afraid, let baby soothe himself/herself without help." Exemplar items from

the delayed responsive subscale (11 items) include "Baby frustrated, let baby cry for a few seconds before responding" and "Baby night cry, let baby cry for a few minutes before responding" demonstrating that the scale included both brief and extended delays in responding, somewhat counter to expectation.

**Table 1.** Correlations assessing convergent and predictive validity of MRQ scales

| | MRQ 6 months | | | | | | MRQ 1 year | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Resp.** | *p* | **Non-resp.** | *p* | **Delay** | *p* | **Resp.** | *p* | **Non-resp.** | *p* | **Delay** | *p* |
| **Maternal characteristics** | | | | | | | | | | | | |
| Agreeableness | .05 | .500 | **−.17\*\*** | .010 | .04 | .589 | .01 | .889 | **−.20\*\*** | .003 | −.02 | .790 |
| Neuroticism | .07 | .309 | **.23\*** | .001 | −.03 | .670 | −.03 | .710 | **.19\*\*** | .000 | −.02 | .750 |
| Depressive Symp. | −.06 | .360 | **.24\*\*** | .000 | .05 | .420 | **−.16\*** | .020 | **.28\*\*** | .000 | .06 | .410 |
| **Observed maternal sensitivity** | | | | | | | | | | | | |
| To nondistress 6 m | −.02 | .826 | **−.27\*** | .000 | .11 | .106 | .12 | .106 | **−.27\*\*** | .000 | .09 | .220 |
| To distress 6 m | .06 | .424 | **−.23\*\*** | .001 | .11 | .000 | **.16\*** | .022 | **−.28\*\*** | .000 | .07 | .342 |
| To nondistress 1Y | −.11 | .122 | **−.33\*\*** | .000 | .17\* | .022 | .00 | .990 | **−.33\*\*** | .000 | −.01 | .926 |
| To distress 1Y | −.10 | .158 | **−.21\*\*** | .003 | .16\* | .026 | .00 | .981 | **−.27\*** | .000 | −.03 | .669 |
| **Mother reported responses to distress 1Y CTNES** | | | | | | | | | | | | |
| Supportive | **.32\*\*** | .000 | **−.39\*\*** | .000 | −.10 | .162 | **.35\*\*** | .000 | **−.25\*\*** | .000 | .06 | .370 |
| Punitive/minimizing | −.00 | .987 | **.20\*\*** | .004 | .07 | .343 | **−.17\*** | .011 | **.33\*\*** | .000 | .19\*\* | .004 |
| **Child outcomes-mother report on BITSEA** | | | | | | | | | | | | |
| Problem 1Y | .08 | .287 | **.34\*\*** | .000 | −.01 | .897 | **−.13\*** | .049 | **.42\*\*** | .000 | .11 | .092 |
| Competence 1Y | **.37\*\*** | .000 | −.11 | .133 | −.05 | .474 | **.36\*\*** | .000 | −.09 | .190 | −.00 | .952 |
| Problem 2Y | .04 | .542 | **.21\*\*** | .003 | −.03 | .711 | −.08 | .295 | **.20\*\*** | .004 | .09 | .217 |
| Competence 2Y | .13 | .069 | **−.18\*** | .010 | .04 | .539 | .06 | .435 | −.09 | .199 | .14\* | .043 |
| **Child outcomes-observed 2Y clean-up task** | | | | | | | | | | | | |
| Distress (% of time) | −.12 | 0.96 | **.17\*** | .019 | .10 | .172 | **−.15\*** | .047 | .12 | .098 | .08 | .293 |

*N* ranges from 189 to 224.
\* *p* < .05, \*\* *p* < .01. Correlations that were significant with the Benjamini–Hochberg correction are bolded.

Confirmatory factor analysis was used to determine if this three-factor structure was replicated based on mothers' reports on the MRQ at 14 months. Method effects were controlled by correlating error terms for (i) all items within a story stem/vignette and (ii) all items that were repeated across vignettes. In addition, the three factors were allowed to correlate. This resulted in an acceptable model fit, $\chi^2 (850) = 1529.61$, $p < .001$; RMSEA = .06, 95% CI [.055, .065], CFI = .91. Although a non-significant chi-square value is preferred, this index is affected by having a large number of indicators of manifest variables, in which case the other indices of fit

need to be taken into consideration (Kenny & McCoach, 2003). A RMSEA below .08 and CFI greater than .90 indicate adequate fit. Based on these results, items were averaged to create subscale scores for the MRQ at 6 months and at 1 year. The three MRQ scales had high internal consistency with Cronbach's α at 6 and 14 months respectively as follows: .93 and .92 for responsiveness; .94 and .94 for delayed responsiveness; and .89 and .88 for non-responsiveness.

MRQ subscales correlated modestly to moderately with one another at 6 months and 14 months, respectively, as follows: responsiveness and non-responsiveness, $r = -.17; p < .05$ and $r = -.28, p < .01$; responsiveness and delayed responsiveness, $r = -.26, p < .01$ and $r = -.10, ns$, and delayed responsiveness and non-responsiveness, $r = .43; p < .01$ and $r = .36, p < .01$ ($df = 222$ at 6 months and 207 at 1 year). This suggests they tap unique dimensions of responsiveness. All three subscales demonstrated high stability from 6 to 14 months postpartum: $r = .52$ for responsiveness, .52 delayed responsiveness, and .50 for non-responsiveness, all $df = 207, p < .01$.

For descriptive purposes, correlations between maternal demographic characteristics and MRQ subscales were examined. Non-responsiveness was higher among younger ($r = -.17$ and $-.16, p < .05$ at 6 months and 1 year respectively), less educated ($r = -.17$ and $r = -.16, p < .05$, at 6 months and 1 year respectively), and lower-income mothers ($r = -.20, p < .01$ at 1 year). Delayed responsiveness was higher among higher income ($r = .17, p < .05$, at 6 months) and more educated mothers ($r = .15, p < .05$, at 6 months). Responsiveness was higher among younger ($r = -.20, p < .01$ at 6 months), less educated mothers ($r = -.17, p < .05$, at 6 months). European American mothers reported engaging in less non-responsiveness ($r = -.15, p < .05$, at both time points) and responsiveness ($r = -.15, p < .05$ at 6 months) and more delayed responsiveness ($r = .17, p < .05$ at 6 months) relative to African American mothers. However, maternal race did not correlate significantly with MRQ subscales when maternal age, income, and education were controlled via partial correlations. MRQ subscales did not vary as a function of infant gender.

Primary correlations related to the convergent and predictive validity of MRQ scales are presented in Table 1. Given the number of correlations examined for each subscale at each time point ($n = 14$), the Benjamini–Hochberg alpha correction was applied to reduce the likelihood of chance findings (McDonald, 2014). Correlations that remained statistically significant after this correction are boldfaced in the table; others are considered statistically nonsignificant. In regard to convergent validity, measures of maternal personality and concurrent depressive symptoms correlated in the expected manner with non-responsiveness in six out of six associations, mean $r$ (absolute value across all correlations) = .22; this was the case for one of six correlations with responsiveness, mean $r = .06$, and for 0 out of 6 correlations with delayed responsiveness, mean $r = .04$. Measures of observed maternal sensitivity correlated negatively with the non-responsiveness scales in eight out of eight analyses, mean $r = -.27$. In contrast, significant correlations were not found in most of the analyses between observed maternal sensitivity and responsiveness (1 statistically significant correlation; mean $r = .01$) and delayed responsiveness (0 statistically significant correlations, mean $r = .08$) on the MRQ. With respect to convergent validity with the CTNES questionnaire at 1 year, four of four correlations with MRQ non-responsiveness were significant, all with the predicted valence (e.g. supportiveness correlated negatively with non-responsiveness), and the mean $r$ (absolute value) was .29. Three of four

correlations with MRQ responsiveness were significant and of the predicted valence (e.g. supportiveness correlated positively with responsiveness), and the mean $r$ (absolute value) was .21. On the other hand, none of the correlations with delayed responsiveness were significant; mean $r$(absolute value) was .06. Thus, MRQ non-responsiveness demonstrated good convergent/divergent validity with maternal characteristics, observed maternal sensitivity, maternal reports on the CTNES. Evidence of convergent validity was modest for the responsiveness scale and not apparent for the delayed responsiveness scale.

In regard to predictive validity, the non-responsiveness scale at 6 months correlated with mother-reported and observed child outcomes in the predicted fashion (i.e. non-responsiveness was linked with more behaviour problems, higher distress, and less competence) in four out of five analyses, mean $r$ (absolute value) = .20, and in two out of 5 analyses at 1 year, mean $r$ = .18. Responsiveness at both 6 months and 1 year correlated with one out of five child outcomes (competence), mean $r$ = .10 and .16 respectively. Delayed responsiveness was unrelated to all child outcomes at both time points, mean $r$ = .05 and .08.

In addition, mothers of avoidant infants reported engaging in significantly higher levels of non-responsiveness at 6 months ($M$ = 1.71, $SD$ = 1.18) than mothers of secure ($M$ = 1.30, $SD$ = .53) and resistant infants ($M$ = 1.08, $SD$ = .14), $F$ (2, 200) = 4.64, $p$ < .01. There were no attachment-based differences in responsiveness or delayed responsiveness at 6 months, or any MRQ subscale at 1 year. Thus, the MRQ non-responsiveness scale demonstrated good predictive validity, with 7 (5 at 6 months, 2 at 1 year) out of 12 analyses demonstrating significant results all consistent with prediction. Responsiveness demonstrated modest predictive validity (2 out of 12 analyses significant and consistent with prediction), and delayed responsiveness did not demonstrate predictive validity (0 out of 12 analyses significant).

**Discussion**

In the current report, we examined the factor structure of the MRQ, stability over time, and convergent and predictive validity. Exploratory and confirmatory factor analyses provided evidence for a three-factor structure to the MRQ: responsiveness, delayed responsiveness (ranging from a few seconds to minutes), and non-responsiveness (ranging from 10 min delay to no response). Each of the three scales demonstrated good internal consistency, and they were stable from 6 months to 1 year, consistent with prior research using observational measures (e.g. NICHD Early Child Care Research Network, 1999), but only the non-responsiveness scale demonstrated consistent evidence for convergent and predictive validity.

That is, consistent with prediction, mothers who indicated that they wait 10 min or longer to respond to their crying infants, if at all, were more likely to report elevated depressive symptoms, and to be higher in neuroticism and lower in agreeableness, factors generally associated with insensitive and non-responsive parenting (Belsky & Jaffee, 2006). That non-responsiveness was higher also among mothers at greater socio-demographic risk (i.e. younger, lower income, less educated) is consistent with the notion that the stress affiliated with low economic conditions may undermine maternal responsiveness. Moreover, mothers who reported higher non-responsiveness were consistently rated as less sensitive than other mothers and also reported engaging in more negative and punitive responses and fewer supportive responses when their

toddlers are upset. Thus, the non-responsiveness scale appears to validly capture early individual differences in non-responsive behaviour, one type of insensitive behaviour. The non-responsiveness scale also demonstrated predictive validity to child outcomes. As hypothesized, maternal non-responsiveness was linked with children's higher problem behaviours, higher affect dysregulation, and attachment avoidance, consistent with prior literature and theory (Ainsworth et al., 1978; Cassidy, 1994; Goldberg et al., 1994; Landry et al., 2006; Leerkes et al., 2009). Evidence for predictive validity was somewhat greater for mothers' reports of non-responsiveness at 6 months than at 1 year, perhaps because young infants are especially dependent on external assistance with emotion regulation.

The pattern of results related to the responsiveness and delayed responsiveness scales of the MRQ suggest they are not valid measures. There was no evidence of convergent or predictive validity of the delayed responsiveness scale when the alpha correction was applied. In observational studies, brief delays lasting just a few seconds have been associated with higher sensitivity and more optimal outcomes (Beebe et al., 2010; Bornstein & Manian, 2013). On the MRQ, mothers reported delaying responses for a few seconds to up to a few minutes and the extent to which this is an appropriate response is likely very dependent on the nature of the situation (e.g. having a tantrum vs. being afraid). It would seem that more detailed scenarios, and narrower response options reflecting the timing of response (e.g. 1 to 5 s, 6 to 10 s etc) would be needed to tease this out, and it is not entirely clear that mothers could accurately self-report on the timing of their responses with this level of precision.

There was modest evidence of convergent and predictive validity for the responsiveness scale which may reflect the distinction between responsiveness and sensitivity. That is, responsiveness is a necessary but not sufficient condition of sensitive responding (Crockenberg & Leerkes, 2011). Some mothers who respond promptly or with a bit of delay when their infants cry may respond in harsh or intrusive manner or in a manner that is not well matched with the infants' underlying state. The MRQ does not adequately tap into these features. Furthermore, mothers may overestimate their level of responsiveness. At this point, we believe it is unlikely that any self-report of parenting during infancy could adequately assess the features of sensitive responding related to the quality of the response. These issues may explain why responsiveness was higher among mothers at socio-demographic risk, and why responsiveness and non-responsiveness were modestly negatively correlated, both counterintuitive findings.

Given the pattern of results, it appears that the 13 item non-responsiveness subscale meaningfully assesses the extent to which mothers engage in highly non-responsive responding to infant crying. Given its brevity, this subscale could easily be implemented in large scale research. The measure could also be used to supplement observational measures, and may be especially useful to investigators who are interested in responsiveness to infant distress given it is difficult to observe this aspect of responsiveness (Leerkes, Parade, & Gudmundson, 2011). Given the nature of the scale, specific items could also be used to examine basic questions regarding contextual differences in the extent to which mothers are non-responsive (e.g. when infants are frustrated vs. afraid). In contrast, the responsiveness and delayed responsiveness subscales are not as promising. In general, it seems doubtful that a self-report measure could be designed that adequately addresses the issues of noting the timing of responsiveness with accuracy and rating oneself on the quality of responses.

Strengths of this study include the diverse sample and the careful observational measures of sensitivity and inclusion of maternal reported and observed child outcomes. In sum, the newly developed Maternal Responsiveness Questionnaire demonstrated the anticipated three-factor structure, good reliability, and internal consistency and was stable over a 6 month period. The non-responsiveness subscale is a promising measure for future research given it demonstrated good convergent and predictive validity; this is not the case for the responsiveness or delayed responsiveness subscales.

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**Appendix**

***Factor Loadings from Final Three-Factor Exploratory Factor Analysis (Oblimin Rotation) of Maternal Responsiveness Questionnaire (MRQ) 6-month data (N = 224).***

| MRQ Items That Loaded on Subscales | 1 | 2 | 3 |
|---|---|---|---|
| Q6h. Baby afraid, let baby cry until stops crying on own. | **.89** | −.03 | −.09 |
| Q2h. Baby frustrated, let baby cry until stops crying on own. | **.83** | −.06 | −.10 |
| Q1o. Mom busy, let baby cry until you are done. | **.81** | .01 | −.09 |
| Q6g. Baby afraid, let baby cry for 10 or more minutes before responding. | **.78** | .05 | .11 |
| Q4m. Mom free time, let baby cry for 10 or more minutes before responding. | **.77** | .03 | .15 |
| Q7h. Unknown why baby cry, let cry until baby stops crying on own. | **.75** | −.05 | .01 |
| Q4n. Mom free time, let baby cry until you are done. | **.74** | .11 | −.12 |
| Q5g. Baby night cry, let baby cry himself/herself back to sleep. | **.72** | −.05 | −.00 |
| Q2g. Baby frustrated, let baby cry for 10 or more minutes before responding. | **.71** | −.06 | .21 |
| Q1n. Mom busy, let baby cry for 10 min while finish. | **.70** | .03 | .14 |
| Q3g. Baby sick, let baby cry for 10 or more minutes before responding. | **.70** | −.03 | .09 |
| Q3h. Baby sick, let baby cry until stops crying on own. | **.61** | .08 | .05 |
| Q5f. Baby night cry, let baby cry for 10 or more minutes before responding. | **.46** | −.08 | .26 |
| Q4e. Mom free time, play with baby if he/she feels lonely. | −.00 | **.74** | −.11 |
| Q1e. Mom busy, play with baby if he/she seems lonely. | −.01 | **.74** | −.02 |
| Q4d. Mom free time, check to see how baby is feeling. | .09 | **.74** | −.09 |
| Q4c. Mom free time, initiate interaction with baby. | .08 | **.74** | .03 |
| Q4g. Mom free time, make point of interacting with baby every few minutes. | .03 | **.70** | −.08 |
| Q1c. Mom busy, initiate interaction with baby. | .12 | **.68** | −.03 |
| Q2a. Baby frustrated, comfort your baby. | .04 | **.65** | −.15 |
| Q1d. Mom busy, check to see how baby is feeling. | .07 | **.63** | −.10 |
| Q2b. Baby frustrated, get baby interested in fun activity. | .10 | **.62** | .01 |
| Q1g. Mom busy, make point of interacting with baby every few minutes. | .00 | **.62** | .03 |

| MRQ Items That Loaded on Subscales | 1 | 2 | 3 |
|---|---|---|---|
| Q4b. Mom free time, place baby where you can see each other. | −.05 | **.62** | .04 |
| Q4a. Mom free time, respond playful if baby smiles or coos. | −.09 | **.60** | .10 |
| Q7a. Unknown why baby cry, comfort your baby. | .00 | **.57** | −.15 |
| Q7b. Unknown why baby cry, get baby interested in a fun activity. | −.09 | **.57** | .07 |
| Q1b. Mom busy, place baby where can see each other. | −.18 | **.56** | .10 |
| Q6b. Baby afraid, get baby interested in a fun activity. | .11 | **.56** | −.07 |
| Q3b. Baby sick, get baby interested in fun activity. | .11 | **.54** | .03 |
| Q1h. Mom busy, get out something fun for baby. | −.09 | **.54** | .25 |
| Q4i. Mom free time, stop what doing immediately if baby wants attention. | .06 | **.50** | −.20 |
| Q1i. Mom busy, stop what doing immediately if baby wants attention. | .04 | **.50** | −.20 |
| Q1j. Mom busy, find a way to finish work while involving baby. | .05 | **.49** | −.06 |
| Q1a. Mom busy, respond playful if baby smiles or coos. | −.07 | **.47** | .03 |
| Q6a. Baby afraid, comfort your baby. | −.22 | **.45** | .02 |
| Q4h. Mom free time, get out something fun for baby. | −.07 | **.44** | .17 |
| Q3d. Baby sick, respond to baby immediately. | −.08 | **.43** | −.13 |
| Q7f. Unknown why baby cry, let cry for few minutes before responding. | .12 | −.08 | **.72** |
| Q4k. Mom free time, let baby cry for few seconds before responding. | .02 | −.02 | **.71** |
| Q4l. Mom free time, let baby cry for few minutes before responding. | .29 | −.07 | **.69** |
| Q2f. Baby frustrated, let baby cry for few minutes before responding. | .23 | −.03 | **.69** |
| Q2e. Baby frustrated, let baby cry for few seconds before responding. | −.09 | .05 | **.63** |
| Q1l. Mom busy, let baby cry for a few seconds while finish. | .01 | .05 | **.58** |
| Q7e. Unknown why baby cry, let cry for few seconds before responding. | −.11 | −.02 | **.58** |
| Q1m. Mom busy, let baby cry for a few minutes while finish. | .31 | −.03 | **.56** |
| Q5e. Baby night cry, let baby cry for few minutes before responding. | .13 | −.03 | **.54** |
| Q5d. Baby night cry, let baby cry for few seconds before responding. | −.04 | −.07 | **.49** |
| Q3e. Baby sick, let baby cry for few seconds before responding. | .05 | −.04 | **.45** |

| MRQ Items That Did not Load or Cross-Loaded (Removed From Final Factor Analysis) |
|---|
| Q1f. Mom busy, let your child entertain himself/herself. |
| Q1k. Mom busy, respond as soon as your child begins to cry. |
| Q2c. Baby frustrated. Let your child soothe himself/herself without your help. |
| Q2d. Baby frustrated. Respond to your child immediately. |
| Q3a. Baby sick. Comfort your child. |
| Q3c. Baby sick. Let your child soothe himself/herself without help. |
| Q3f. Baby sick. Let your child cry for a few minutes before responding. |
| Q4f. Mom free time. Let your child entertain himself/herself. |
| Q4j. Respond as soon as your child begins to cry. |
| Q5a. Baby night cry. Comfort your child until he or she goes back to sleep. |
| Q5b. Baby night cry. Comfort your child for a few minutes, and then let him or her try to go back to sleep on his or her own. |
| Q5c. Baby night cry, respond to your child immediately. |
| Q6c. Baby afraid. Let your child soothe himself/herself without your help. |
| Q6d. Baby afraid. Respond to your child immediately. |
| Q6e. Baby afraid. Let your child cry for a few seconds before responding. |
| Q6f. Baby afraid. Let your child cry for a few minutes before responding. |
| Q7c. Unknown why baby cry. Let your child soothe himself/herself without your help. |
| Q7d. Unknown why baby cry. Respond to your child immediately. |
| Q7g. Unknown why baby cry. Let your baby cry for 10 or more minutes before responding. |

*Note.* Bolded factor loadings reflect retained items. Factor 1 = non-responsiveness, Factor 2 = responsiveness, Factor 3 = delayed responsiveness

**Instructions:** Mothers experience all different types of situations with their babies. Please rate how often you respond to your baby in each the following ways for each situation or a similar situation below on a 5-point scale, where 1 = never and 5 = always.

Question stems:

**Q1** When you are trying to do housework, pay the bills, or make dinner, how often do you…

**Q2** When your baby is crying because he/she is frustrated by something (e.g. can't reach a toy he/she), how often do you

**Q3** When your baby is crying because he or she is sick or ill (e.g. has a cold, is teething, is feeling poorly after shots), how often do you…

**Q4** When you have a few free minutes to relax to yourself, how often do you…

**Q5** When your baby awakens in the middle of the night and cries, how often do you…

**Q6** When your baby is crying because he/she is afraid of something or someone (e.g. loud toy, a dog, an unfamiliar person), how often do you…

**Q7** When your baby is crying even though he or she is well fed, well-rested, and has a fresh diaper, how often do you…