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The Recorded Interaction Task: A validation study of a new observational tool to assess mother-infant bonding

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CONFLICTS OF INTEREST

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PRÉCIS

The novel Recorded Interaction Task demonstrates acceptable face and content validity and appears to be a viable observational tool for assessment of mother-infant bonding.

ABSTRACT

Introduction

Mother-infant bonding describes the early emotional connectedness between a mother and her infant. The quality of the mother-infant bond early in life is related to the subsequent quality of the child's attachment, the quality of further mother-infant interactions, and various other social outcomes across the child's lifespan. The Recorded Interaction Task (RIT) was developed to assess mother-infant bonding using observational methods in a naturalistic but standardized setting, thus addressing shortcomings of previous self-report tools. The RIT focusses on the common interaction between mother and infant (aged 2 to 5 months old), during a diaper (nappy) change. The interaction is video recorded and later assessed. The RIT must be validated before it can be used to assess mother-infant bonding in future research or in clinical practice.

Methods

Face and content validity of the RIT were assessed by a panel of 6 experts in bonding and assessment of maternal and infant behavior. The RIT and self-reported Postpartum Bonding Questionnaire (PBQ) were administered to 15 mother-infant dyads with the correlation between their scores used to assess convergent validity.

Results

Acceptable face and content validity of the RIT was demonstrated. A weak correlation between the RIT and PBQ ($r=-0.13$) and their subscales ($r=-0.22$) were observed. A strong correlation between the RIT maternal behavior and infant behavior subscales was recorded ($r=0.69$).

Discussion

The RIT appears to be a viable tool for the observational assessment of mother-infant bonding. Reliability testing and piloting will be required before the RIT can be used in future research or clinical practice.

KEYWORDS

Behavior Observation Techniques, Infant, Methods, Mother-Child Relations, Psychometrics, Reproducibility of Results, Validation Study.

QUICK POINTS

- Current tools used to assess mother-infant bonding employ self-report methods, and thus are reliant on just the mother's experience and perception.
- The Recorded Interaction Task was developed to address shortcomings of previous tools and assesses mother-infant bonding via observational methods.
- The novel Recorded Interaction Task demonstrated acceptable face and content validity.
- The Recorded Interaction Task appears to be a viable tool in assessing the mother-infant bond, in both future research and clinical practice.

INTRODUCTION

Mother-infant bonding refers to the early emotional connectedness between a mother and her infant.¹ The term is often linguistically confused with mother-infant attachment.^{1,2} Attachment theory was developed by Bowlby^{3,4} which describes an infant's or child's behavior towards their mother, wherein the child selectively seeks out the mother in times of stress as a means of achieving comfort, or exhibits emotion on separation. Mother-infant bonding is primed by the hormone oxytocin.⁵ A mother's endogenous oxytocin system plays a crucial role in the induction of labor,⁶ with high levels of the hormone observed post-pregnancy in new mothers.^{7,8} As such, new mothers are predisposed to form bonds and exhibit affiliative behavior with their infant.^{9,10} Many additional factors influence the mother-infant bond, including mental health, pregnancy and birth history, actual and perceived support, and infant factors such as sleep difficulties.² Mothers may face varying trajectories of

bonding with their infant depending on if they are the birthparent, adoptive mother,¹¹ or had a surrogate birth.¹²

Whilst mother-infant bonding and mother-infant attachment are 2 separate constructs, the nature of the mother-infant bond may directly influence the development of a child's attachment style.¹

Furthermore, strong mother-infant bonding is related to higher quality mother-infant interactions including breastfeeding duration^{13,14} and increased maternal responsiveness and sensitive parenting, such as perceptual responses.^{9,15,16} Such behaviors, in turn, affect social outcomes across childhood, adolescence and adulthood including social competence and ability to manage social interactions and adapt, reduced psychopathology, increased empathy, emotion regulation, and increased cognitive development and physical health.^{1,17-19} Given the importance of early mother-infant bonding, it is critical to have a valid tool available to assess and describe the characteristics of the mother-infant bond.

A recent scoping review examined tools available to assess mother-infant bonding.² Available tools include the Postpartum Bonding Questionnaire (PBQ),²⁰ the Mother-to-Infant Bonding Scale,²¹ the Mother and Baby Interaction Scale,²² and Mother-Infant Bonding Questionnaire.²³ Each tool reports adequate validity and reliability and many have been translated and adapted to various other languages and cultures.²⁴⁻²⁸ However, all tools employ maternal self-rating scales.

In the field of mother-infant bonding assessment, the PBQ²⁰ is the most widely used and accepted assessment tool. Whilst this tool demonstrates both adequate validity and reliability, the self-report nature of the PBQ may reflect a mother's perception of their relationship with their infant, rather than their actual behavior. Self-report methods also are subject to further sources of error including susceptibility to socially desirable responses; incomplete or missing data; poor participant memory or motivation; and under- or over-estimation of a response.²⁹ Furthermore, the authors of the PBQ have stated that "direct observation is the 'gold standard' for the study of the mother-infant relationship" (p. 239).^{20, p 239}

Therefore, the Recorded Interaction Task (RIT) was developed to assess mother-infant bonding using observational methods. The RIT focusses on the interaction between mother and infant during a diaper (nappy) change, a universal event frequently undertaken by mothers and their infants. The interaction is video recorded and then later assessed. Both maternal behaviors and infant behaviors are scored on an observation scoring sheet. The scores from the maternal behavior and infant behavior subscales are combined, and a final score of mother-infant bonding is determined. The observation scoring sheet was adapted from the Nursing Child Assessment Feeding Scale, originally developed by Barnard.^{30,31} Maternal behaviors assessed on the observation scoring sheet relate to sensitivity, handling, vocalization, visual and facial expressions, while infant behaviors assessed relate to handling (response to being touched), vocalizations and visual expression and cues. Items listed under each behavior are rated on a scale of 1 (never) to 5 (always).

The RIT was initially assessed in a preliminary study that assisted in clarifying the optimal setting and age range in which the tool should be administered, and specifying behaviors which should be included on the observation scoring sheet.³² However, the RIT must be validated before it can be used to assess mother-infant bonding in future research or in clinical practice. The aim of the current study is to assess the face, content, and convergent validity of the RIT.

METHODS

Face validity and content validity

A panel of experts, including psychiatrists and mother-infant therapists, with specialized expertise in bonding and assessment of maternal and infant behavior were consulted to obtain specialist opinion on face and content validity of the RIT. Experts were emailed an information package containing a copy of the RIT observation scoring sheet; an example video recording of mother-infant interaction; an expert response form; and a cover letter that included the purpose of the study, the reason the expert was selected, a description of the RIT and its scoring system, and an explanation of the expert response form. The example video was recorded with a volunteer mother-infant dyad for the purpose of being used as an example diaper change interaction.

Experts returned their completed RIT observation scoring sheet, which was marked using the example video, and their expert response form. The latter collected data on each individual item of the RIT observation scoring sheet, and on the RIT as in its entirety. Experts were prompted to mark each item on the RIT observation scoring sheet as “valid,” “potentially valid,” or “not valid” as a measure for assessing mother-infant bonding, and to provide written comment for each item if they saw fit. Experts also indicated the validity of the RIT tool as a whole. Validity scores for the RIT tool overall were compiled and assessed to determine the face validity of the RIT. Validity scores and written comments for each item of the RIT observation scoring sheet were compiled and assessed to determine RIT content validity.

Convergent validity

Participants

A convenience sample of mother-infant dyads was recruited via social media advertisements and word-of-mouth. Inclusion criteria were mothers over the age of 18 with an infant aged 2 to 5 months, singleton birth, and ability to understand and communicate in English (as all communication and tools were administrated in English). Infants between the ages of 2 to 5 months were included following expert consensus that the behaviors listed on the RIT observation scoring sheet would be achievable and identifiable by infants at this age. Infants not of a singleton birth were excluded as mother-infant interactions may be influenced in twin or triplet families.³³⁻³⁵ Ethics approval was granted by the Women’s and Children’s Health Network Human Research Ethics Committee prior to study commencement, and written informed consent obtained from all mother-infant dyads prior to participation.

Procedure

Mother-infant dyads were seen across 2018 and 2019, at a clinical trial facility, to ensure a standardized environment in a clinical consultation room. The RIT and PBQ (as a comparator) were

administered. The following demographic information was collected: mothers' age, ethnicity, marital status, education, and current employment status; and infants' age (months), sex, and ethnicity.

The Recorded Interaction Task

Mothers were advised to hold their infant in front of their chest, and as video recording started were instructed to place their infant on the changing mat and change their infant's diaper in the same manner as normal. Video recording stopped following completion of the diaper change. The video recordings, lasting between 1:11 and 4:42 minutes, were assessed at a later date.

RIT Scoring

The RIT observation scoring sheet (Appendix 1) was utilized to assess mother-infant bonding from the recorded interactions. Items on the RIT observation scoring sheet include both maternal and infant behaviors. Each item was scored depending on how frequently it was observed throughout the video recording, on a Likert scale of 1 (never) to 5 (always). Maternal and infant behavior ratings were combined to give a final score of mother-infant bonding. Possible scores range from 17 to 85. Lower scores, specifically those less than 35 (being the result of consistently low scores for each item), signify poorer bonding. Whilst scores less than 35 may signify concern of bonding quality, this value is not a clinical cut-off, and nor does it diagnose a bonding disorder. Any additional key behaviors observed in the recorded interactions were also documented in the notes section of the RIT observation scoring sheet, for example, maternal intrusiveness, inappropriate or over-soothing behavior.

The Postpartum Bonding Questionnaire

The PBQ²⁰ consists of 25 statements for the mother to indicate how often each is true for her on a 6-point scale of always to never. Responses are given a numerical value, with some items being scored in reverse, and combined to give a total mother-infant bonding score. The PBQ consists of 4 subscales: subscale 1 assesses general bonding (12 questions with maximum score of 60), subscale 2 assesses severe disruptions to bonding (7 questions with maximum score of 35), subscale 3 assesses

infant-focused anxiety (4 questions with maximum score of 20), and subscale 4 assesses infant-directed abuse with the purpose of identifying dangerous mothers (2 questions with maximum score of 10).²⁰ Scoring above 12 on subscale 1 is considered to highlight impaired bonding.²⁰ Scoring above 13 on subscale 2 also highlights impaired bonding.²⁰

Statistical analysis

Face and content validity of the RIT were assessed by descriptive statistics. Convergent validity of the RIT was assessed by using Pearson correlation to quantify the relationship between the RIT and the PBQ. For this comparison, a sample size of 15 achieves 80% power to detect a difference between a null hypothesis correlation of 0, and the alternative hypothesis correlation of 0.7, using a 2-sided hypothesis test with a significance level of 0.025. The latter was set to allow for correlation tests against the PBQ sub-scales.

RESULTS

Face validity and content validity

Panel demographics

Six experts who specialized in bonding and assessment of maternal and infant behavior were consulted. Experts were personnel within South Australia and Queensland state health departments, including 3 psychiatrists, a developmental psychologist, a mother-infant therapist, and an occupational and infant mental health therapist.

Face validity and content validity

Three experts scored the RIT tool as a whole as “valid.” Two experts scored the RIT tool as “potentially valid.” No response was recorded for one expert for the tool as a whole. Twelve of the 20 items on the RIT observation scoring sheet were scored “valid” by all (n=6) or most (n=5) experts. Of the remaining items, 2 received a “not valid” score from one expert, and 8 received a mixture of “valid” and “potentially valid” scores.

Written comments were recorded by at least one expert for each of the 20 items on the RIT observation scoring sheet. Comments of items which received “not valid” scores or a mixture of “valid” and “potentially valid” scores were analyzed. Comments often questioned feasibility of the item, for example for the infant behavior item “actively resists by stretching or moving,” the following comments were recorded: “Moving/stretching not always resistive” and “Depends if child is an active explorer.” Comments also suggested alterations to wording of items, but were often minor, for example for the mother behavior item “Amount mother smiles or laughs to the infant,” the following comment was recorded: “Replace ‘to’ with ‘with’.” Comments also highlighted possible behaviors that may need to be noted if seen when assessing particular items. For example, for the mother behavior item “Amount mother smiles or laughs to the infant,” the following comment was recorded: “Depends on if appropriate – eg, if infant is distressed you wouldn’t want to see smiling! All about mirroring.” For the mother behavior item “Makes soothing sounds,” the following comment was recorded: “Again – is it what is needed in the moment – over soothing is not a sign of bonding – related to parent fear.”

Few changes were made to the RIT observation scoring sheet following expert feedback. Items scored as “valid” or “potentially valid” were retained. Assessment of the infant behavior “actively resists by stretching or moving” was removed from the scoring sheet as consensus was this behavior is not relevant for infants aged 2 to 5 months. Recording of infant initial and predominant state was also removed following a score of “not valid” by one expert. This was replaced with a section to note any key behaviors for the mother, or key infant states. Addition of this section also addressed the expert comments that other behaviors or concerns may need to be noted when seen during the assessing of particular items, for example if a mother’s behavior was intrusive or inappropriate to their infant’s needs at the time. While this section provides opportunity for qualitative data to be recorded if necessary, comments here are not involved in determining the final score of mother-infant bonding. Suggestions for minor wording alterations were discussed. For example, for the comment suggesting to “Replace ‘to’ with ‘with’” for the maternal behavior item “Amount mother smiles or laughs to the infant,” was not altered as the word change would mean scoring a mother’s smiling or laughter would

be dependent on if her infant was also smiling or laughing. The consensus was that this maternal behavior should still be scored, regardless of the infant's behavior at the time. The updated RIT observation scoring sheet was used in determining convergent validity.

Convergent validity

Participant demographics

Fifteen mother-infant dyads were observed in 2018 and 2019. Mothers were aged between 24 and 43 years with a mean (SD) age of 31 (5.6) years. All mothers were white (n=15), married (n=13) or engaged (n=2), and had at least a secondary school education. Infants were aged between 3 and 5 months with a mean (SD) age of 4.2 (0.7) months. The majority of infants were their mother's first-born child (n=12). The majority of infants were male (n=12), and all were white except one subject who was white and Indian.

Convergent validity

Mean (SD) scores obtained from participants for both the RIT and the PBQ are outlined in Table 1. The RIT total scores indicated good overall bonding. The PBQ total scores also indicated good overall bonding. Only one mother scored above the PBQ subscales 1 and 2 thresholds for impaired bonding with scores of 18 and 30 respectively. The correlation between the RIT maternal behavior subscale and the RIT infant behavior subscale was $r=0.69$ ($P=0.004$; 95% CI, 0.27 – 0.89) indicating that bonding behaviors between mother and infant were reciprocal. For example, if maternal behaviors scored highly, her infant's behaviors also scored highly.

An overview of correlations between the RIT and the PBQ is given in Table 2. No strong correlation was found between the RIT and the PBQ or its subscales, or the RIT maternal behavior subscale and the PBQ or its subscales. A weak negative correlation was reported between the RIT and the PBQ subscales 1 and 2, and the RIT maternal behavior subscale and the PBQ subscales 1 and 2. This highlights a weak convergence between the RIT and the PBQ subscales that assess impaired bonding.

Notably, the PBQ is scored in the inverse direction to the RIT, hence negative correlations were expected.

DISCUSSION

The current study aimed to assess the face, content, and convergent validity of the RIT. The RIT was developed to address shortcomings of previous tools in the assessment of mother-infant bonding and is the first tool reported to use observational methods to assess this relationship. As such, it has the potential to be superior in the measurement of mother-infant bonding.

Face and content validity were investigated, and results demonstrated acceptable validity for both measures. This was indicated by scores given to the RIT tool overall, by the frequent “valid” responses to individual items, and the small number of changes required made to the RIT observation scoring sheet as suggested by experts. These changes included the removal of 2 items, and the addition of 2 further items to record any key behavior notes. As such the RIT observation scoring sheet now contains 19 items (Appendix 1).

The convergent validity between the RIT and the PBQ was also investigated. Convergent validity assesses the extent to which a new tool correlates with another tool which is known to measure the same or similar phenomena.³⁶ As the PBQ is reported to measure disruptions to the mother-infant bond, and is widely utilized in the literature, it was chosen to examine RIT convergent validity. While the PBQ consists of 4 subscales, it is subscales 1 and 2 that assess general bonding and severe disruptions to bonding.²⁰ As such, the correlation between the RIT and the PBQ subscales 1 and 2 was also assessed. An additional consideration is that the RIT assesses both maternal and infant behaviors, whereas the PBQ only assesses maternal self-reported behaviors. Thus, the correlation between the RIT maternal behavior subscale and the PBQ subscales 1 and 2 were also assessed.

A weak negative correlation was recorded between the RIT and the PBQ subscales 1 and 2, and the RIT maternal behavior subscale and the PBQ subscales 1 and 2. The RIT employs observational methods to assess both maternal and infant behavior to determine mother-infant bonding. Thus, for

the assessment of the convergent validity of the RIT, it was difficult to locate an appropriate tool as there appeared none in the literature that were similar.² Like other available tools to assess mother-infant bonding, the PBQ records subjective, self-report measures from the mother. As such, a high correlation with the RIT was not expected. As stated, a weak negative correlation between the RIT and the PBQ was reported, highlighting some convergence of the tools, in the expected direction. While only weak convergent validity is demonstrated, it is possible the RIT may be more specifically associated with the assessment of mother-infant bonding than the PBQ. This is hypothesized as the PBQ also assesses several other factors including infant-focused anxiety and infant-directed abuse. Secondly, the RIT may have shifted to eliminate the subjectivity of the PBQ activity.

Further, the RIT appears specifically suited to assessing the mother-infant bond, as opposed to mother-infant attachment. While the two terms are often used synonymously in the literature,^{1,2} this is done so incorrectly. Mother-infant bonding refers to the early emotional connectedness between a mother and her infant and is often described as a reciprocal process.^{1,37} Mother-infant attachment, however, describes an infant's attachment to their mother. For this reason, the RIT was developed to assess both maternal and infant behaviors when determining the quality of the mother-infant bond. The strong positive correlation observed between the RIT maternal behavior subscale and the RIT infant behavior subscale in the current study, therefore supports the two-way reciprocal process and suggests that the RIT is in fact measuring the mother-infant bond.

As stated, the RIT has demonstrated acceptable validity and is a viable observational tool for the assessment of mother-infant bonding. The tool is not without limitations, including the potential for behaviors and results to be influenced by participant social desirability bias. Social desirability bias refers to the tendency of participants to act in a way they believe is the most socially acceptable, rather than in a manner more reflective of their true norm.³⁸ As mothers were observed at a trial facility, in the presence of an observer and video recorder, and were performing a reasonably vulnerable interaction with their infant, there is possibility of social desirability bias influencing behaviors. While mothers were not informed that mother-infant bonding was being assessed in an

attempt to mitigate bias, behaviors still may have been affected by what participants believed was socially desirable, as is also likely to occur in any form of testing setting.

Observing participants in this manner may introduce some bias; however, standardizing the environment in which participants were observed was still important. Further, it was assumed mothers were aware of their observation. Observing mothers in a way that mimicked a naturalistic form of stress test may have elicited minor discomfort, causing behaviors that the RIT assesses to be more exaggerated and thus identifiable.

The homogeneity of the sample population is worth noting. The sample was primarily comprised of mothers who had given birth to their first child, and few who had given birth to their second or third, which somewhat limits the generalizability of the RIT's use among infants from subsequent births. Similarly, as this study has assessed the validity of the RIT for use in mother-infant populations, there is limited generalizability to other populations that may share a relationship and bond with an infant. Future research may investigate the potential of the RIT to be applied to further populations that interact with infants, including fathers, caregivers or grandparents. All women were either married or engaged, well-educated, and white. This limits generalizability, and future research may look to validate the RIT in additional populations, including single mothers, various socioeconomic groups, and differing racial or cultural groups. Finally, all mothers who participated in the study were the birthparent of their infant, further increasing the homogeneity of the sample. Future research may seek to include mothers of adopted children, mothers that had a surrogate birth, and mothers who were assigned male at birth but identify as a female.

The absence of a clinical cut-off score for poor mother-infant bonding is another potential limitation of the RIT. While lower scores indicate poorer bonding, a clinical cut-off score that would diagnose a bonding disorder was not determined. Studies in future may determine a clinical cut-off point for poor mother-infant bonding for use as a diagnostic tool. An additional limitation to the current study was the lack of availability of tools to correlate against the RIT. As there appears no other observational tool to assess mother-infant bonding in the literature, a less appropriate tool was utilized to assess RIT

convergent validity. The adequate face and content validity reported still provides support of the RIT's validity; however, the tool still requires reliability analysis and piloting. Now that the validity of the new RIT tool has been established, ongoing research will determine the intra- and inter-rater reliability of the RIT.

CONCLUSION

The RIT demonstrates acceptable face and content validity. While a weak correlation was observed between the RIT and the PBQ, a strong correlation between the RIT maternal and infant behavior subscales was present, supporting the claim that the RIT targeted the assessment of mother-infant bonding. Reliability testing and piloting of the RIT is required before use in further research and application in clinical settings.

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TABLES

Table 1. Recorded Interaction Task and Postpartum Bonding Questionnaire mean scores (n=15)

Tool (subscale)	Score, mean (SD)
RIT total	57 (9)
RIT (maternal behavior subscale)	44 (7)
RIT (infant behavior subscale)	13 (2)
PBQ total	10 (9)
PBQ (subscale 1)	5 (4)
PBQ (subscales 1 and 2 combined)	6 (7)

Abbreviations: PBQ, Postpartum Bonding Questionnaire; RIT, Recorded Interaction Task.

Table 2. Correlations of the Recorded Interaction Task and Postpartum Bonding Questionnaire (n=15)

	<i>r</i> (<i>P</i> , 95% CI)		
	PBQ Total	PBQ Subscale 1	PBQ Subscales 1 and 2 Combined
RIT Total	-0.13 (0.64, -0.60 to 0.41)	-0.22 (0.43, -0.66 to 0.33)	-0.21 (0.45, -0.65 to 0.34)
RIT Maternal Behavior Subscale	-0.13 (0.63, -0.60 to 0.41)	-0.22 (0.43, -0.66 to 0.33)	-0.22 (0.43, -0.66 to 0.33)

Abbreviations: PBQ, Postpartum Bonding Questionnaire; RIT, Recorded Interaction Task.

APPENDIX 1 – The Recorded Interaction Task Observation Scoring Sheet

THE RECORDED INTERACTION TASK (RIT) OBSERVATION SCORING SHEET

Participant no: _____ Date: _____

Each item is rated on a scale of 1 (never) – 5 (always)

Mother's behavior

Sensitivity

Responds to infant's cues appropriately 1 – 2 – 3 – 4 – 5

Comments verbally on infant's state 1 – 2 – 3 – 4 – 5

Diverts infant's attention through playing games, introducing toys or making faces 1 – 2 – 3 – 4 – 5

Handling

Non-functional handling (stroking, rubbing, kissing, cuddling) 1 – 2 – 3 – 4 – 5

Avoids rough handling or abrupt movements 1 – 2 – 3 – 4 – 5

Avoids slapping, hitting or spanking the infant 1 – 2 – 3 – 4 – 5

Vocal

Makes sympathetic or positive verbalization when necessary 1 – 2 – 3 – 4 – 5

Makes soothing sounds 1 – 2 – 3 – 4 – 5

Doesn't raise voice 1 – 2 – 3 – 4 – 5

Avoids making negative comments about infant to researcher 1 – 2 – 3 – 4 – 5

Visual

Amount and concentration which mother looks at the infant's face 1 – 2 – 3 – 4 – 5

Facial expressions

Amount mother moves her head and face in communication with the infant 1 – 2 – 3 – 4 – 5

Amount mother smiles or laughs to the infant 1 – 2 – 3 – 4 – 5

Infant's behavior

Handling (response to being touched)

Calms at touch 1 – 2 – 3 – 4 – 5

Vocal

Responds to mother's voice (general quieting, eye shift to mother) 1 – 2 – 3 – 4 – 5

Visual

Averting gaze from mother 1 – 2 – 3 – 4 – 5

Quality and quantity of looking at mother's face and eyes (may or may not be associated with mother's cues) 1 – 2 – 3 – 4 – 5

Notes

Mother

Record key behaviors if observed (intrusive, distant, avoidant, disinterested, forced, reciprocal, resistive, inappropriate, over-soothing, etc.)

Infant

Record infant initial and/or predominant state (level of sleep, drowsy, alert, fussing or crying)

Scoring

Mother total: _____

Infant total: _____

Total combined score of mother-infant bonding: _____