

# Effects of interactive behavioural cues-based massage on hyperbilirubinaemia, breastfeeding and growth of term infants

Infant massage is indicated for increased weight gain and improved neurodevelopment in term and preterm infants. In addition, massage therapy has been known to decrease bilirubin levels and promote stool frequency in term infants and improve self-confidence in new mothers. This study evaluates the effects of an interactive behavioural cues-based infant massage programme on admission rates for hyperbilirubinaemia, frequency of breastfeeding and the growth of healthy term infants. The findings suggest that training mothers to identify infant behaviour cues has beneficial effects.

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Neonatal jaundice is a potential cause of neonatal morbidity and mortality affecting both term and preterm infants during the first week of life. It is indicated by high levels of bilirubin in the circulation (hyperbilirubinaemia) as well as clinical signs that include yellowing of the skin and sclera.<sup>1</sup> While most cases of neonatal jaundice are generally harmless, there are some pathological causes of jaundice in newborns that may need to be diagnosed. Non-invasive phototherapy is commonly used to treat neonatal hyperbilirubinaemia, however there are potential side effects of phototherapy including:<sup>1,2</sup>

- imbalance in the thermal environment and dehydration
- disruption of circadian rhythms
- watery diarrhoea
- bronze baby syndrome
- interference with maternal-infant interaction.

In Thailand, parents are informed of the potential outcomes of neonatal jaundice, which can include neurodevelopmental effects, hearing loss and, in severe cases, death.<sup>2</sup> Thai mothers of infants with hyperbilirubinaemia suffer from anxiety and stress, as evidenced through both clinical studies<sup>1,3,4</sup> and the author's clinical experiences. This is compounded when mothers observe their babies being treated with phototherapy. They report stress and less self-confidence in their 'mother role'. Thai mothers also harbour feelings of guilt if their baby requires readmission resulting from hyperbilirubinaemia.<sup>3,4</sup>

Effective bonding requires intimacy and a sense of touch and visual acuity allowing the baby to give cues or otherwise signal his/her needs so that the mother can respond.<sup>5-7</sup> Despite phototherapy being a non-invasive form of treatment, it leads to mother-infant separation, feelings of emotional distress and the risk of postpartum depression.<sup>3,4</sup>

Maternal stress can have negative effects on breastfeeding and breast milk production.<sup>3,8</sup> Therefore preventing neonatal hyperbilirubinaemia or controlling the level of serum bilirubin to within a normal range is important.

Baby massage is a traditional practice in many areas of the world. Current evidence supports the advantages of infant massage, including:<sup>1,5,6,9-20</sup>

- weight gain
  - improved sleep-wake patterns
  - improved neurodevelopment of preterm infants
  - reduced infant stress, as reflected by lower serum cortisol levels
  - promotion of early-stage defecation and stool frequency in full-term newborns, encouraging bilirubin elimination and resulting in a reduction of bilirubin levels.
- A randomised double-blind clinical trial study showed that massage therapy combined with phototherapy can reduce serum total bilirubin of term infants.<sup>1</sup> The findings of several studies have revealed that massage given to infants by their mothers can:<sup>1,5,6,9-20</sup>
- improve physiologic and behavioural responses

## Keywords

infant massage; weight gain; breastfeeding frequency; neonatal jaundice; hyperbilirubinaemia

## Key points

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1. Maternally administered massage promotes increased frequency of breastfeeding and weight gain in term infants.
2. An interactive behavioural cues-based massage programme can decrease the rate of hospital readmission due to neonatal hyperbilirubinemia.

- promote positive parent-infant interactions
- improve and maintain strong attachment between the mother and her infant
- encourage the mother's confidence in her abilities and her adaptation to motherhood
- decrease maternal stress
- relieve the maternal depression of teenage mothers.

It is accepted that positive mother-infant attachment is a critical factor in the promotion of optimal infant growth and development. Given the ease and low cost of this treatment regimen and its potential short- and long-term benefits at both the family and national level, this study set out to determine the applicability and success of baby massage in preventing neonatal jaundice and its potential to impact on breastfeeding.

## Methods

The study presented here aims to determine the effects of massage in an interactive behavioural cues-based infant massage (IBIM) programme on the admission rate of infants with hyperbilirubinaemia, the frequency of breastfeeding, and the growth of healthy full-term infants in Thailand.

### Study design

A quasi-experimental study between two groups (32 in the experimental group, 30 in the control group) was conducted from May 2014 to January 2015 at Thammasat University Hospital, Thailand, and at the homes of the mothers that were included in the research.

Between the dates of this study, all mother-infant dyads that were admitted to hospital and met the study inclusion criteria (TABLE 1) were included in the research. After informed consent was obtained, a random sampling method was used to assign pairs of mothers and infants to the experimental group or to the control group.

### Demographics

Before inclusion in the study a research assistant completed a demographic intake survey with the mothers and collected information from the medical records of the infants. This demographic survey included the mother's age, level of education, marital status, family income and number of pregnancies. For the infant, the data included gender, chronological and

<b>For mothers</b>
To have had a normal labour
Free of any medical conditions that affect breastfeeding and with a LATCH (breastfeeding assessment tool) score $\geq 8$ in the first 24 hours following delivery
Can communicate well in Thai
Willing and able to follow-up with the researcher via telephone after hospital discharge and bring their baby to the hospital at six weeks post delivery
Have no prior knowledge of infant massage
Have no medical conditions that might prohibit giving their infant massage therapy
<b>For infants</b>
Absence of any diagnosis of neonatal jaundice during routine post-birth hospitalisation
Apgar scores $>8$ and no pathologies that inhibit normal breastfeeding or prohibit infant massage therapy
Born healthy at 38-42 weeks' gestation and with a birth weight of 2,800-3,600g
Discharged from hospital with their mother

TABLE 1 Inclusion criteria.

gestational age, birth weight, Apgar score, duration of hospitalisation, and body weight at two days following birth.

### The intervention

IBIM is a one-on-one, mother-infant interactive protocol, which was conceived by the author after participation in an infant massage programme under Tiffany Field PhD of the Touch Research Institute, University of Miami. The study outline was developed following a literature review and the observations of experiential evidence of visible behavioural cues<sup>21</sup> and mother-infant interaction. The protocol included the massage procedure applied by the mother; the mother's assessment of her infant's behavioural cues before and during the massage; established eye contact and other appropriate interactions (eg emotional expression, vocal communication).

### Data collection

During the study period all mothers continued to receive their routine nursing care as provided by the hospital, which included postpartum care, newborn care, breastfeeding techniques, and education and instructions for the discharge of the mother and infant.

Thirty pairs of mother and infants that were receiving routine care were assigned to the control group. On the last day of the study (six weeks after delivery), control group mothers brought their babies to the hospital. A breastfeeding log was completed and their baby's weight recorded. At this point the IBIM

programme was offered to the control group mothers so that their babies did not miss out on the benefits of the massage programme.

Thirty-two pairs of mothers and infants that were receiving routine care were assigned to the experimental group. The mothers were assigned to participate in the IBIM programme within 24 hours of delivery. Training sessions of 45 minutes were given to the mothers, which included education about infant behavioural cues (stress and engagement), demonstrations of infant massage techniques, how to interact with the baby, and practise with infant massage on infant manikins until the mother could massage with the proper techniques. Mothers received an IBIM and frequency of breastfeeding logbook, developed by the researcher to record experiences. The mothers were taught to observe the signs that their baby fed well, eg the baby releases from the breast by its own choice, the baby appears content and happy after a feed, the baby's hands may be in fists before feeding but will often relax after a feed. If the mother observed these signs and felt that her baby had a successful breastfeeding experience, she would record the session in the breastfeeding log. The mothers recorded the number of breastfeeding sessions in each 24-hour period for six weeks.

After training, the mothers provided interactive infant massage and they observed and responded to their infant's behavioural cues and adjusted their massage accordingly. The massage was carried out twice daily for 15 minutes,

before feeding, every day for seven days until discharge from the hospital. If the mother and infant were discharged before seven days, the mother continued to massage her infant from the start day (day 2 of the infant's life) to day 7, twice daily for 15 minutes before feeding at home. This ensured that all participants practised the same technique, timing and duration of massage.

After day 7, participants massaged their babies at least once a day for 15 minutes until six weeks after birth.

During the home stay, the researcher conducted follow-up phone calls every week until six weeks after birth. The mother could consult the researcher about the massage and also any breastfeeding issues or care for her newborn. The routine six-week postpartum check-up for the mother provided a convenient in-hospital opportunity to obtain the infant's weight.

### Outcome measures

1. The admission rate of babies with hyperbilirubinaemia after first discharge.
2. The frequency of breastfeeding.
3. Infant body weight at six weeks after birth.

### Statistical analyses

An independent t-test and chi-squared test were used for data analysis. Statistical significance was set at p-value <0.05.

### Results

Sixty-two mother-infant dyads took part in the study (32 pairs in the IBIM group and 30 pairs in the control group). No significant differences existed among the demographic variables of the mother's age, level of education or family incomes between IBIM group and control group and no significant differences among the infant variables (gestational age, birth weight, Apgar score, duration of infant's hospitalisation, body weight at day 2).

#### Admission rate for hyperbilirubinaemia after first discharge

There were no significant differences in bilirubin levels before discharge but throughout the study the infants in the IBIM group showed lower hospital admission rates due to neonatal hyperbilirubinaemia than the control group with statistical significance (p-value <0.05) (TABLE 2). Three babies (9.4%) in the experimental group were admitted with neonatal hyperbilirubinemia compared with seven (23.3%) in the control group.

Variable	Control group		Experimental group		t
	Mean	SD	Mean	SD	
Hospital admission rate due to neonatal hyperbilirubinaemia	0.233	0.43	0.09	0.296	-1.08
Weight gain (g)	1091.67	251.53	1255.6	296.17	-2.01
Frequency of breastfeeding (mean number of sessions in six weeks)	281.733	27.986	304.406	4.309	-4.39

**TABLE 2** Comparison of hospital admission rate, weight gain at six weeks after birth and frequency of breastfeeding at six weeks post delivery between the experimental and control groups using the independent t-test.

#### Infant body weight at six weeks

The results indicate that the infants in the IBIM group had more weight gain than the infants in the control group with statistical significance (p-value <0.05) (TABLE 2).

#### Frequency of breastfeeding

Mothers in the IBIM programme reported greater frequency of breastfeeding throughout the study compared to the mothers in the control group (p-value <0.05) (TABLE 2).

### Discussion

#### Reduction of hospital admission rate due to hyperbilirubinaemia

IBIM reduced the rate of hospital admission due to hyperbilirubinaemia. At Thammasat University Hospital discharge normally occurs two days after a healthy birth. In this study no differences existed between the control and IBIM groups' serum bilirubin levels on the second day after birth, prior to hospital discharge. Normally, full-term newborn babies present signs of hyperbilirubinaemia two to four days after birth.<sup>1,22</sup> The results of this study support a conclusion that an IBIM programme initiated prior to hospital discharge and maintained at home can benefit bilirubin levels.

In other studies:<sup>1,5,6,9-12,15-20</sup>

- transcutaneous bilirubin measurements increased much less in a massaged premature infant group (compared to controls) on the third and fourth days after intervention
- total serum bilirubin measurements significantly decreased (compared to controls) from the second to fifth days and on the fourth day in a massaged full-term newborn group
- baby massage in healthy term newborns yielded lower bilirubin levels compared to the control group

- a systematic review of the literature on the benefits of massage for term infants presented improved weight gain, growth, sleep patterns and decreased hyperbilirubinaemia
- a programme of massage plus phototherapy reduced the total serum bilirubin in jaundiced newborns
- a systematic review concluded that massage therapy could be an effective adjunct to phototherapy in order to reduce the phototherapy duration, although it doesn't appear to reduce the requirement for phototherapy.

#### Increased weight gain

This study revealed that infants in the interactive infant massage group weighed significantly more than those in the control group at six weeks of age.

These findings are consistent with a systematic review of the benefits of massage for term and preterm infants as being effective for promoting weight gain.<sup>1,5,6,9-20</sup> Although the precise cause and effect of infant massage on weight gain has not been confirmed, several studies have postulated that massage may help to improve the maturation of the central nervous system by normalising its functions, increasing the secretion of neuroendocrine substances necessary for growth, moderating cortisol production, promoting glucocorticoid receptors in the hippocampus and also increasing vagal activity, which aids in the secretion of gastrointestinal hormones (mainly insulin and gastrin) important for food absorption and increased calorie consumption.<sup>5</sup>

#### Increased frequency of breastfeeding

This study produced significant observations in terms of the frequency of breastfeeding in the interactive infant massage group.

Transition to a mothering role following

birth can be a major challenge and create insecurity and stress for some mothers. During this period, a mother has to identify her baby's needs, baby's cues and provide appropriate responses to enable mother and baby to get to know each other and develop strong attachment.<sup>5,6</sup> Several studies have revealed that mothers with postpartum depression are more likely to discontinue breastfeeding at 4-16 weeks postpartum.<sup>8,23-25</sup>

In this study, the IBIM programme provided mothers with information about their infant's behavioural and stress cues and offered effective ways to communicate with the infant. Mothers learnt how to interact with their babies and to better understand behavioural cues. The interactive infant massage procedure is an intimate series of mother-infant interactions; the mothers and their infants touch, maintain eye contact and the mothers talk to their baby. Consequently, they become more sensitive and aware of their infant's likes and dislikes.<sup>26</sup>

The mothers in this study reported that they felt more connected with their baby; they reported having more self-confidence in understanding and interpreting their baby's behaviours and responding to their baby appropriately. The mothers felt that they had an improved sense of mothering and this improved comfort helped them to feel less stress, feel more relaxed, and to have a desire to maintain exclusive breastfeeding. Additional studies are needed to determine if massage can promote duration of breastfeeding over the long term.

The findings in this study are consistent with several studies indicating that infant massage is a helpful tool for improving mother's interaction skills, decreasing maternal stress, promoting stronger relationships with their babies and more positive attitudes towards taking on the mother's role.<sup>5,6,9-20,25</sup>

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## References

1. **Abdellatif M, Lam Vuong N, Tawfik GM, et al.** Massage therapy for the treatment of neonatal jaundice: a systematic review and network meta-analysis. *J Neonatal Nurs* 2020;26:17-24.
2. **Boskabadi H, Zakerihamidi M, Moradi A, Bakhshae M.** Risk factors for sensorineural hearing loss in neonatal hyperbilirubinemia. *Iran J Otorhinolaryngol* 2018;30:195-202.
3. **Bungrathok B, Rongtonggul R, Srikanjanapert S, et al.** Maternal stress and coping in neonatal jaundice treated with phototherapy at Srinagarind hospital. *Srinagarind Med J* 2007;22:133-38.
4. **Komthong N, et al.** Impact of a stress-reduction caring program on post-childbirth mothers undergoing phototherapy. *Thai J Nurs Council* 2013;28:88-97.
5. **Field T.** Infant massage therapy research review. *Clin Res Pediatr* 2018;1:1-9.
6. **Gurol A, Polat S.** The effects of baby massage on attachment between mother and their infants. *Asian Nursing Research (Korean Society of Nursing Science)* 2012;6:35-41.
7. **Shoghi M, Sohrabi S, Rasouli M.** The effects of massage by mothers on mother-infant attachment. *Alt Ther Health Med* 2018;24:34-39.
8. **Pope CJ, Mazmanian D.** Breastfeeding and postpartum depression: an overview and methodological recommendations for future research. *Depress Res Treat* 2016;1-9.
9. **Bennett C, Underdown A, Barlow J.** Massage for promoting mental and physical health in typically developing infants under the age of six months. *Cochrane Database Syst Rev* 2013:CD005038.
10. **Lee H.** The effect of infant massage on weight, height, and mother-infant interaction. *J Korean Acad Nurs* 2006;36:1331-39.
11. **Lotfalipour B, Tirgari B, Pouraboli B, Mirzaee M.** Effect of preterm infant massage by the mother on the mood of mothers having preterm infants. *J Chiropr Med* 2019;18:67-76.
12. **Midsund A, Litland A, Hjälmhult E.** Mothers' experiences learning and performing infant massage - a qualitative study. *J Clin Nurs* 2019;28:489-98.
13. **O'Higgins M, St James Roberts I, Glover V.** Postnatal depression and mother and infant outcomes after infant massage. *J Affect Disord* 2008;109:189-92.
14. **Onozawa K, Glover V, Adams D, et al.** Infant massage improves mother-infant interaction for mothers with postnatal depression. *J Affect Disord* 2001;63:201-07.
15. **Oswalt K, Biasini F.** Effects of infant massage on HIV-infected mothers and their infants. *Pediatr Nurs* 2011;16:169-78.
16. **Porter LS, Porter BO, McCoy V, et al.** Blended infant massage: parenting enhancement program on recovering substance-abusing mothers' parenting stress, self-esteem, depression, maternal attachment, and mother-infant interaction. *Asian Nurs Res* 2015;9:318-27.
17. **Serrano MS, Doren FM, Wilson T.** Teaching Chilean mothers to massage their full-term infants: effects on maternal breast-feeding and infant weight gain at age 2 and 4 months. *J Perinatal Neonatal Nurs* 2010;24:172-81.
18. **Diego M, Field T, Hernandez-Reif M.** Preterm infant weight gain is increased by massage therapy and exercise via different underlying mechanisms. *Early Hum Dev* 2014;90:137-40.
19. **Vicente S, Verissimo M, Diniz E.** Infant massage improves attitudes toward childbearing, maternal satisfaction and pleasure in parenting. *Infant Behav Dev* 2017;49:114-19.
20. **Urquhart O, Urquhart C, Gracey J.** Maternally-administered massage and weight gain in preterm and low birthweight infants: a systematic review. *Infant* 2018;14:193-97.
21. **Brazelton TB, Nugent JK.** Neonatal Behavioural Assessment Scale. Third ed. Clinics in Developmental Medicine, No 137. London: MacKeith Press; 1995.
22. **Lain SJ, Roberts CL, Bowen JR, Nassar N.** Early discharge of infants and risk of readmission for jaundice. *Pediatrics* 2015;135:314-21.
23. **Field T.** Postpartum depression effects on early interactions, parenting, and safety practices: a review. *Infant Behav Dev* 2010;33:1.
24. **Lau C.** Effects of stress on lactation. *Pediatr Clin North Am* 2001;48:221-34.
25. **Matthiesen AS, Ransjo-Arvidson AB, Nissen E, Uvnaas-Moberg K.** Postpartum maternal oxytocin release by newborns: effects of infant hand massage and sucking. *Birth* 2001;28:13-19.
26. **Juaneau AL, Aita M, Heon M.** Review and critical analysis of massage studies for term and preterm infants. *Neonatal Netw* 2015;34:165-77.

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