

# **Piloting kangaroo mother care in the community: dyadic responses to a novel innovation facilitating skin-to-skin contact**

**Roisin Bailey**

**Helen McIntyre**

**Merryl Harvey**

## **Introduction**

Skin-to-skin contact between a mother and her baby may first occur straight, or soon after birth, where the naked baby is dried and placed prone on the mother's bare chest. The maternal chest is regarded as the ideal evolutionary habitat for the fulfilment of the baby's immediate and long-term biological needs through its own neurodevelopment, such as the establishment of feeding (Moore *et al* 2016).

Kangaroo mother care (KMC) was developed in Bogotá, Colombia in 1979 (Rey & Martínez 1983). It consists of a care package that incorporates early, continuous, or prolonged mother-baby skin-to-skin contact, ideally with exclusive breastfeeding, and early discharge from the hospital unit, with appropriate neonatal follow-up (World Health Organization 2003). This care package was designed in response to inadequate incubator facilities for low birth weight babies which, once stable, required support only to feed and grow (World Health Organization 2003).

A systematic review of trials using KMC demonstrated a reduction in neonatal morbidity and mortality rates in low birth weight and premature babies when compared to babies receiving incubator care (Conde-Agudelo & Díaz-Rossello 2016). Meta-analysis of neonatal outcomes for preterm and full-term babies being cared for in KMC demonstrated a reduction in the incidence of neonatal sepsis, hypothermia and hyperthermia, hypoglycaemia, and hospital readmission — concluding that implementation strategies were necessary to facilitate KMC across the neonatal population (Boundy *et al* 2016).

Breastfeeding behaviour also differs between babies receiving KMC and those receiving swaddling or cot care. Mother-baby skin-to-skin contact following birth results in increased effectiveness of the first breastfeed (Moore *et al* 2016), and is associated with an increase in breastfeeding exclusivity up to six months postpartum (Vaidya *et al* 2005).

Despite rigorous data on safety and neonatal health benefits, implementation of KMC within high-income settings has remained low (Engmann *et al* 2013). UNICEF's Baby Friendly Initiative standards advocate maintaining close proximity between the mother and baby, and skin-to-skin contact from birth, and throughout the postnatal period (UNICEF UK Baby

Friendly Initiative 2012). However, routine separation of mothers and babies immediately following birth has occurred widely in industrialised nations since the 20<sup>th</sup> century, with babies being dressed and wrapped, and cared for in a crib or nursery (Moore *et al* 2016). Further separation of the mother-baby dyad may result from obstetric or neonatal medical interventions, such as maternal caesarean section, or admission to a neonatal special care unit. Specific to the UK, extremely low breastfeeding rates, coupled with discouragement of mother-baby bed-sharing, based on the association between co-sleeping and sudden infant death syndrome (National Institute for Health and Care Excellence (NICE) 2006, The Lullaby Trust 2017), may also contribute to the separation of the baby from the evolutionary habitat of the maternal chest.

### **A novel innovation**

A novel health innovation has been designed to facilitate dyad-led KMC in the context of a population of healthy mothers, and their healthy, term babies. This aims to counteract the routine separation of the dyad on a non-medical basis both in acute settings, and within the community. It constitutes a specially-designed soft, cotton top with an in-built pouch to support the baby against the mother's chest. This can be used at home or within the hospital or birth centre, and as frequently, or for as long as, the mother wishes.

The garment was commissioned by Dr Helen McIntyre, Senior Midwifery Lecturer at Birmingham City University, and has been developed as part of a joint enterprise between the midwifery and fashion departments. The garment is currently pending patenting, prior to further production.

This pilot study is part of a larger PhD research project, and opens a growing research focus with Birmingham City University, investigating the effects of a facilitation strategy of KMC on maternal and neonatal health and well-being.

### **Ethics**

The research proposal was presented to both the Health, Education and Life Sciences Faculty Academic Ethics Committee at Birmingham City University, and the Health Research Authority. Favourable ethical opinion was gained from both committees.

### **Aims**

The research project aims to explore what impact the facilitation of skin-to-skin contact may have on skin-to-skin contact uptake and duration, infant feeding practices, maternal-infant

interaction and bonding, and maternal experience of using the innovation as part of motherhood.

A pilot study was designed to trial the garment with a minimum of ten healthy mother-infant dyads, receiving routine postnatal and neonatal care in the community. The pilot study aimed to investigate the garment's effect on neonatal thermoregulation, maternal-infant feeding and responsiveness, and the maternal perception of wearing and using the garment. This constituted a preliminary safety and efficacy evaluation of the garment to guide subsequent design and methodology changes necessary for a larger trial.

## **Methodology**

### ***Recruitment***

The mixed method design of the pilot study gathered quantitative and qualitative data on safety, efficacy and experience of using the garment to facilitate kangaroo care. Direct observation of the mother-infant dyads using the garment at home was used to collect data on the dyad's behaviour whilst having skin-to-skin contact. This direct observation occurred on a single occasion, lasting between forty minutes to two hours, as led by the maternal participant.

A table was completed by the maternal participants, documenting neonatal axilla temperature readings and a multiple-choice neonatal behavioural state ranking, recorded before and thirty minutes into the skin-to-skin episode. In addition to participant-led data collection, verbatim comments elicited spontaneously, or through direct questions related to the design, fit, and appearance of the garment, were transcribed, and researcher field notes documenting maternal vocal tone and body language, and signs of mother-infant reciprocal bonding and feeding were recorded contemporaneously.

A checklist was used as an audit tool to assess the safe positioning and fit of the garment, completion of the data collection sheet, and adherence to the study documentation detailing safe usage and correct thermometer use. The checklist was completed by the researcher at the end of the home visit.

The methodology was designed to be woman-centred, with the data collection taking place at the mother's home, and the mother instigating and discontinuing the data collection episode, as well as assessing and recording her baby's temperature and behaviour.

### **Setting**

Pregnant and postnatal women were recruited across three months in the inpatient and outpatient settings of an NHS trust in England facilitating around 6000 births per year. Participants were recruited from antenatal and postnatal wards, parent craft classes, and antenatal and community clinics. Data collection visits took place in the participants' homes across the locality. Several visits took place during unusually high seasonal temperatures, averaging 20–30 degrees Celsius.

### **Sample recruitment**

The sample of women all met inclusion criteria of a singleton pregnancy, with spontaneous or induced labour on or after 37 weeks' gestation, resulting in a vaginal birth. Maternal participants had booked their pregnancy at a specific NHS trust in England, and had basic spoken English as a first or additional language. Participants were recruited antenatally, irrespective of pregnancy-risk status that did not affect the exclusion criteria.

Maternal exclusion criteria were: aged less than 16 years old, multiple pregnancy, a caesarean birth, current high-dependency care, and significant child protection concerns. Maternal participants were diverse in ethnicity, nationality, age and parity. Nine of the 11 participants' postcodes generated an Index of Multiple Deprivation Score (National Perinatal Epidemiology Unit 2017); the remaining two postcodes produced no results. Eight of the nine scores were within the 5<sup>th</sup> centile of most deprived, and one was in the 3<sup>rd</sup> centile.

The sample of infants all met inclusion criteria of a birth weight  $>/2500\text{g}$ , born at or after 37 completed gestational weeks, aged from newborn to six weeks old. Infants requiring transitional, special or intensive care at the time of data collection were excluded from the study.

Inclusion and exclusion criteria were applied antenatally following an expression of interest in the study, and repeated postnatally following birth, prior to consenting to participate.

Demographic, medical, obstetric, and neonatal details were reviewed from the participant's maternity notes to ensure eligibility criteria were met, with prior consent.

Participants had a minimum of two weeks to consider participation after receiving a participant information sheet. Of the 18 women who expressed interest antenatally, and remained eligible for participation, 11 chose to participate in the study.

### **Table 1. Dyad demographic details**

Dyad subject	Maternal age (years)	Parity	Ethnicity and nationality	Gestation at birth (week+day)	Birth type	Neonatal age (days)	Neonatal birth weight (grams)
1	29	3	5	42+2	SVB	20	3050
2	26	2	5	39+6	SVB	9	3240
3	39	1	1	39+4	NBF	5	3320
4	23	2	6	42+2	SVB	12	3840
5	26	1	4	40+4	SVB	4	3300
6	35	3	7	38+3	SVB	6	2900
7	30	2	2	38+4	SVB	14	4000
8	30	1	6	41+6	VEN	7	3160
	24	1	2	40+5	SVB	10	3320
10	27	2	5	37+5	SVB	11	2500
11	32	2	1	41+0	SVB	9	4300

Ethnicity key: 1 White British, 2 White European, 3 Irish Traveller/Roma, 4 Black British, 5 Black African/Caribbean, 6 British Asian – Indian subcontinent, 7 Asian – Indian subcontinent, 8 Asian – other, 9 Mixed ethnicity.  
Birth type key: SVB Spontaneous vaginal birth, NBF Neville Barnes forceps assisted birth, VEN Ventouse assisted birth.

### Instruments and equipment

Neonatal axilla temperatures were monitored using Omron EcoBasic axilla thermometers, issued by the researcher to each participating dyad. Garments were issued to each participating dyad based on maternal pre-pregnancy clothing size. Garments were returned to the researcher immediately following data collection until preliminary pilot data analysis and quality control testing demonstrated no issues with quality or design. Following this, participants that remained in the six week postnatal period could opt to have the garment back. No cost was incurred by the participants for study equipment or participation.

### Outcome measures

Axilla temperatures were recorded to one decimal place as displayed on the thermometers. Temperatures within the range of 36.5–37.5 degrees celsius were regarded as normal (Wyllie *et al* 2015). The same researcher recorded field notes with each dyad, including on infant feeding. This constituted whether the infant had a breast or bottle feed, infant feeding cues and maternal responsiveness, and the infant's positioning for the feed, recorded as longitudinal, oblique, or transverse in relation to the maternal spine (Colson 2005). Infant feeding cues and maternal responsiveness were assessed using Cadwell's breastfeeding assessment (2007) and themes from the Responsiveness to Child Feeding Cues Scale (Hodges *et al* 2013), which applied to neonates.

An 11 point checklist was completed by the researcher to audit compliance to safe usage instructions, completion of the data collection sheets, and axilla temperatures within normal

parameters (Wyllie *et al* 2015). Checklists scoring 11/11 were the outcome measure for safe usage of the garment and appropriate documentation.

## Recruitment and retention

The target for recruitment was met and exceeded, with one additional participating dyad. Recruitment took place over three months, with one third of the thirty-three women recruited antenatally proceeding to study enrolment. A fifty per cent attrition rate was forecast, which was exceeded, with a recruitment to enrolment attrition rate of 66%.

## Results

### *Safety checklist*

All audit checklists scored a maximum of 11/11, demonstrating participant adherence to the study design and safety information.

### *Neonatal temperature and behaviour changes with the garment*

The eleven participating dyads collected data on the neonate's behaviour and temperature before, and during, skin-to-skin contact. The second range of temperatures were taken 30 minutes after the commencement of skin-to-skin contact, apart from dyads 1 and 7, where the second temperature was taken at 15 minutes, prior to maternal-led discontinuation of the skin-to-skin episode.

**Table 2. Neonatal temperature and behaviour during garment facilitated skin-to-skin contact (SSC)**

Neonate	Feeding practice	Temperature before SSC (°C)	Temperature during SSC (°C)	Temperature difference (°C)	Behaviour before SSC	Behaviour after SSC	Duration of SSC (minutes)
1	BF	36.7	36.8	+0.1	3	4	15
2	BF	37.1	37.0	-0.1	3	2	40
3	FF	36.5	36.6	+0.1	2	4	60
4	MF	36.7	36.9	+0.2	3	4	45
5	BF	37.0	36.9	-0.1	3	2, 4	40
6	BF	36.9	36.8	-0.1	3	4	40
7	MF	36.9	36.8	-0.1	3	2	15
8	FF	36.8	36.7	-0.1	4	2	37
9	MF	36.9	36.7	-0.1	4	4	43
10	BF	36.6	36.6	0	1	4	30
11	FF	36.6	36.8	+0.2	4	4	40

Feeding key: BF Breastfeeding exclusively, or with the addition of expressed breast milk supplementation, MF Mixed feeding including breastfeeding and formula feeding, with or without expressed breast milk supplementation, FF Formula feeding exclusively.

Neonatal behaviour key: 1 Unsettled, 2 Settled, 3 Hungry, 4 Asleep.

### ***Neonatal axilla temperature***

The mean temperature difference of the neonates before and during skin-to-skin contact was 0.0 degrees celsius, with the mode average of temperature differences -0.1 degrees celsius. These temperature fluctuations lack clinical or statistical significance in this study. There were no incidences of hypothermia or hyperthermia during participation; the garment maintained normothermic temperatures in all 11 neonates.

### ***Neonatal behaviour***

The most commonly identified neonatal behaviour prior to commencing skin-to-skin contact was 'hungry' (6/11 neonates). Of these six, all went on to breastfeed in skin-to-skin contact. Maternal reactions to their perception of a hungry baby were similar across all six dyads, with breastfeeding initiated by all of the dyads within the first 30 minutes of skin-to-skin contact. None of the mothers identified that skin-to-skin contact had led to their baby being unsettled. Two mothers, who had moved from breastfeeding to formula feeding, voiced their concern prior to skin-to-skin contact that having skin-to-skin contact may unsettle the baby by encouraging rooting at the breast. However, both reported the behaviour as settled or asleep during skin-to-skin contact, with one of the mothers giving a formula feed part way through.

### ***Infant feeding cues and maternal responsiveness***

Feeding cues were observed in eight of 11 dyads. These were increased activity (n=5), head bobbing (n=8), rooting (n=3), and fussing (n=2).

Although six babies were described by their mothers as 'hungry' prior to skin-to-skin contact, eight went on to exhibit feeding cues when in skin-to-skin contact.

Of the eight exhibiting feeding cues, all eight mothers responded by instigating or facilitating a feed, in seven instances, a breastfeed, and in one instance, a formula feed. Of the two neonates who displayed feeding cues and were mixed feeding, both were breastfed rather than formula fed during the skin-to-skin contact.

Maternal responses to feeding cues included verbal cooing and smiling (n=4), stroking of the baby's back and head (n=2), and facilitating the move to the nipple (n=7). Other maternal behaviour noted following feeding cues were: facilitating a change of the baby's position (n=5), reclining their position (n=4), gazing or reciprocal eye contact (n=4), and laughter (n=1).

Dyadic interaction was heightened following commencement of skin-to-skin contact. Four of the 11 mothers expressed their perception of how the baby was feeling. Two mothers spontaneously reported that their baby '*loved it*', one mother reported that her baby '*really liked it*', and one mother asked her baby '*What're you thinking about? Are you happy?*' All 11 mothers increased verbalisations to their babies on commencement of skin-to-skin contact, including use of rhetorical questions, and infant-directed speech.

### **Maternal experience using the garment**

Maternal participants remarked positively on the design, fit, and appearance of the garment. Simple word repetition identified 'safe', 'secure', and 'comfortable' as the most frequently used descriptors of the garment.

None of the participants reported a negative experience; however, one participant discontinued skin-to-skin contact as she felt too hot.

### **Discussion**

In the 11 episodes of trialling the innovation, no adverse outcomes occurred; there was no deterioration perceived in neonatal behaviour, no clinically significant fluctuations in neonatal temperature, and no unsafe positioning of the infant in the garment pouch. Pilot findings suggest the design maintains neonatal temperatures in a thermo-neutral range, with no clinically significant fluctuations in temperature.

Further research is required with an adequately powered sample size to compare neonatal temperature fluctuation in the garment to that in conventionally facilitated skin-to-skin contact. A mixed method, randomised, controlled trial is planned, involving the recruitment of a larger sample of mother-infant dyads meeting the same inclusion and exclusion criteria. Recruitment for the randomised controlled trial will take place at the same NHS trust in England, targeting an ethnically diverse and socio-economically disadvantaged urban population.

The unanticipated use of the garment to support a breastfeed in skin-to-skin contact has emerged from the pilot observations, as mothers used and adapted the garment to support their preferred positioning for breastfeeding. Further research is needed to understand the garment's potential role in breastfeeding uptake, continuation, and exclusivity, in order to guide breastfeeding support practices.

Positive maternal experiences conveyed in this pilot study warrant further exploration of the mother's voice in providing KMC. Experiences of using skin-to-skin contact at home in the



postnatal period will be explored in small focus groups, providing woman-centred data to guide facilitation strategies to support ongoing skin-to-skin contact.

This pilot study supports further exploration into the potential effect skin-to-skin facilitation may have on neonatal thermoregulation, breastfeeding, dyadic bonding, and the mother's experience of caring for her baby through the postnatal period.

*Roisin Bailey, Registered Midwife, PhD student, and Assistant Lecturer in Midwifery, Birmingham City University.*

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