

Research overview: Is there evidence to support the use of soft slings?

Rebecca Glover, an MSc student at the Institute of Child Health, University College London, looks at the evidence on the effectiveness of soft slings.

Carrying babies in a sling is normal practice in many non-western and traditional societies. Holding a newborn in a sling is practical, as it enables mothers to return to their daily activities while keeping their newborn with them and breastfeeding frequently. Constant carrying is rare in western societies; however the use of slings appears to be increasing in popularity, and is promoted on parenting websites such as babywearinginternational.org and naturalmamas.co.uk. Advocates suggest a number of benefits derived from sling use – for example that sling use promotes attachment between mother and infant, that babies held in slings are more content and cry less and that it makes frequent breastfeeding easier.

While evidence on the effects of sling use is still limited, some of the benefits derived from skin-to-skin contact may apply. Skin-to-skin contact immediately after birth results in significant improvements in temperature regulation, breastfeeding, weight gain and attachment for both term and preterm infants.^{1,2} The close contact may allow parents to detect subtle discomfort cues so they can respond before crying begins.

Review of the evidence

To identify and evaluate the available evidence for any effects of sling use, a research review was carried out. Online databases were searched for relevant published literature, and reference lists of relevant papers were manually searched. Paper titles and abstracts were assessed for relevance. Articles were considered relevant if they referred to

The NCT research overview series provides an evidence base to guide the practice of NCT and other transition to parenthood practitioners on topics of relevance during pregnancy, birth, parenthood and the care of babies and toddlers aged 0-2 years. Practitioners must decide how to apply the evidence in their practice but they can feel confident that the research overview provides an up-to-date, balanced and reliable summary and interpretation of the relevant research literature.

carrying, the use of slings or baby carriers in the title or abstract. Observational and experimental studies were included, and articles looking at any effects on infant and/or caregiver health, wellbeing and behaviour were included. Six randomised control trials (RCTs), one observational comparative trial, one qualitative study, two cross-cultural studies and one literature review were identified as relevant studies, and their key findings are summarised below.

Qualitative studies

Anthropological studies provide a useful point of reference from which to consider modern childcare practices. Among the Zinanteco (Mayan Indians), babies are carried at all times in a fabric shawl, with frequent breastfeeding until nine months. In an observational study of infant care and behaviour, no periods of intense crying were observed, and infant cries were rare and brief.³ Among the !Kung San (hunter gatherers), babies are also continuously carried in a sling during the day. An observational study found that the frequency of crying episodes was similar to American and Dutch infants, but the duration and intensity of crying episodes was significantly less.⁴ Bleah & Ellett's qualitative study of recent African migrants to America

explored mothers' responses to infant crying, and found that all the mothers carried their babies whenever possible.⁵ Mothers who worked outside the home attributed their infant's crying to spending less time with them, and to the American custom of giving toys rather than holding in response to crying. The mothers also reported feelings of stress due to separation. As this study indicates, in developed countries, societal expectations in relation to baby care and carrying of infants have changed. Rather than being the norm, it is now seen as an alternative approach to putting the baby in a cot or buggy.

'Societal expectations in relation to baby care have changed.'

Studies have assessed outcomes for babies regularly carried in a sling compared with control groups receiving what is now considered 'standard care'. Four RCTs directly testing the effect of sling use on crying were identified. The earliest study⁶ randomly assigned 99 mothers – 49 to an intervention group who were given a soft sling to use for at least three hours a day, and 50 to a control group. Infant behaviour was recorded in a diary by parents, noting time spent sleeping, feeding, crying or fussing, and content and awake during a 24-hour period at two-week intervals from age four to 12 weeks. In the intervention group the frequency and duration



of crying and fussing was significantly less, and content, awake behaviour significantly greater, compared to the control group. The authors concluded that sling use reduces the frequency and duration of infants crying and fussing.

Barr et al also investigated whether the reduction in crying reported in normal infants could be replicated in infants with colic.⁷ The same study design was used with 66 infants aged four to 12 weeks with excessive crying or colic. The intervention group used a sling for at least three hours per day, but there was no significant difference in duration of crying and fussing between the groups. The authors conclude that sling use is ineffective as a treatment for colic when it is introduced after the crying pattern has been established; they suggest it could be effective as a preventive measure but this has not yet been tested.

Two groups attempted to replicate Hunziker & Barr's positive result. Walker & Menahem⁸ used a similar study design but sling use was only required for two hours a day, and the sample size was small, with only 22 infants in the experimental group and 21 in the control group. The results showed no significant difference in crying frequency and duration between the intervention and control groups. This negative finding could be due to the lower dose of sling use in the intervention group, as the control group reported spending approximately the same amount of time carrying their infant as the group using the sling. St James Roberts et al⁹ used the same study design as Hunziker & Barr but their results also contradicted the original findings, and showed that sling use did not have a significant effect of frequency or duration of crying. It should be noted that in the 1986 study 'participants were unaware of the study hypothesis and specific objective', whereas this was not the case in the more recent studies. In the St James Roberts study participants were explicitly told that the study was to assess the effect of supplementary carrying on excessive infant crying. This could have introduced respondent bias into the results of this study, making the participants more likely to report a positive effect of the intervention, or the control group to carry their babies more often. However this does not appear to have occurred as the study failed to identify a significant effect of sling use on crying, in contrast to the earlier study where participants were unaware of the hypothesis.

St James Roberts et al used an observational study design to assess if different forms of infant care are associated with differences in crying patterns.¹⁰ Parents were recruited to the study from London and Copenhagen

hospitals. Parents who self-identified as using proximal care were recruited from England and Denmark through natural parenting networks and websites to make up the third group in the comparative study. Sample sizes were 113, 75 and 57 respectively for the three groups. Parents recorded infant behaviour in 24-hour diaries. The average length of time infants were held and carried varied significantly between the groups. Proximal care parents held babies for an average of 15 hours per day, Copenhagen parents for 10 hours and London parents for eight hours. Overall London parents had about half the amount of physical contact with their infants compared with proximal care parents. The results showed that differences in caregiving were associated with differences in crying. At two and five weeks of age, London infants cried 50% more than infants in Copenhagen and proximal care groups, and proximal care infants cried more frequently at night at 12 weeks of age than the other groups. This study suggests that the type of infant care typically used by London parents is associated with significantly more crying overall, compared to Copenhagen and proximal care parents. The authors suggest that the key common feature in Copenhagen and proximal care parents is the high levels of holding and responsivity, and that the difference in crying between these groups and the London group is attributed to this difference. However, bouts of 'unsoothable crying' occurred in all three of the groups, and the groups did not differ in unsoothable bouts or in colicky crying at five weeks of age.

'Skin-to-skin care is associated with short-term improvements in breastfeeding.'

Anisfeld et al tested the effect of sling use on the development of attachment between mother and baby in a population of inner city mothers in the USA.¹¹ The authors expected these women of low socio-economic status to have a number of social risk factors that would negatively influence the development of attachment. The study was small: 49 mothers were randomised, 23 to receive a soft baby sling to use every day, and 26 to the control group. At 13 months there were significantly more securely attached babies, measured using the Ainsworth strange situation assessment, in the intervention group (83%) than control group (38%). The sling using mothers also had significantly higher responsivity scores (a measure of

vocal responsiveness based on maternal vocalisations and co-acting after infant vocalisations) than control group mothers. These results demonstrate that in this group of mothers and infants sling use did contribute to better levels of attachment, but replication of the result would give greater certainty.

Safety

Two studies were found investigating the safety of carrying infants in slings, both of which gave positive results. Frisbee and Hennes conducted a literature review of injuries resulting from baby carrier use.¹² They found no reports of injuries associated with baby carriers in peer reviewed literature and only a small number of injuries reported to the USA National Injury Surveillance System. Stening et al investigated the effect of carrying newborns in slings on cardiorespiratory stability.¹³ In a randomised control trial 36 healthy newborns (12 term, 24 preterm) experienced three different methods of carrying (vertical in a sling, horizontal in a sling, in a pram). The infants' breathing and oxygen saturation was measured during the carrying periods. Overall, no clinically significant changes in breathing or oxygen saturation were recorded with either of the sling methods. However, lower oxygen levels were seen in preterm babies, so the authors advised that slings should be used with caution for carrying preterm babies before they reach an age equivalent to 40 weeks gestation.

An important finding from this research review is the scarcity of research on sling use. There is an absence of qualitative research exploring the experiences and feelings of western parents using slings, and a lack of research involving fathers and other caregivers. Research on attachment could be usefully extended to investigate whether particular groups of mothers or caregivers could benefit, for example those who may experience difficulties bonding. It would be interesting to explore the effect of sling use on aspects of behaviour and wellbeing other than crying and attachment, in particular relating to breastfeeding. Skin-to-skin care is associated with short-term improvements in breastfeeding, so there may be grounds for investigating whether sling use also improves breastfeeding continuation.

Limitations

There are important limitations of this review. Only published studies were included and experts in the field were not consulted for information on unpublished data, therefore there is a risk of publication bias. The review only assessed articles published in English so relevant findings from different cultural backgrounds may also have been omitted.

While efforts were made by the researcher to assess studies based on objective criteria to ensure inclusion of relevant studies, these decisions were not validated by other researchers.

Conclusions

The findings do not give conclusive evidence of the effects of sling use on infant and parental behaviour and wellbeing. The evidence for a positive effect of sling use on attachment is suggestive, but a lack of replication of the results prevents firm conclusions being drawn. Similarly the results of the five studies investigating the effect of sling use of at least three hours a day on infant crying are mixed. As several unsuccessful attempts have been made to replicate the positive results originally reported, it is not possible to conclude definitively that sling use does result in less crying. The cross-cultural comparisons provide an interesting basis for further study, but cannot demonstrate a causal relationship between types of infant care and particular behavioural outcomes.

References

- Moore ER, Anderson GC, Bergman N, and Dowswell T. Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Database of Systematic Reviews* 2012, Issue 5. Art. No.: CD003519. DOI: 10.1002/14651858.CD003519.pub3. Available from: <https://www.evidence.nhs.uk/nhs-evidence-content/journals-and-databases>
- Conde-Agudelo A, Belizan JM, and Diaz-Rossello J. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. *Cochrane Database of Systematic Reviews* 2011, Issue 3. Art. No.: CD002771. DOI: 10.1002/14651858.CD002771.pub2. Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD002771.pub2/abstract>
- Brazelton TB, Robey JS, Collier GA. Infant development in the Zinacanteco Indians of southern Mexico. *Pediatrics* 1969;44(2):274-90.
- Barr RG, Konner M, Bakeman R, et al. Crying in !Kung San infants: a test of the cultural specificity hypothesis. *Dev.Med Child Neurol.* 1991;33(7):601-10.
- Bleah DA, Ellett ML. Infant crying among recent African immigrants. *Health Care Women Int* 2010;31(7):652-63.
- Hunziker UA, Barr RG. Increased carrying reduces infant crying: a randomized controlled trial. *Pediatrics* 1986;77(5):641-8.
- Barr RG, McMullan SJ, Spiess H, et al. Carrying as colic "therapy": a randomized controlled trial. *Pediatrics* 1991;87(5):623-30.
- Walker AM, Menahem S. Intervention of supplementary carrying on normal baby crying patterns: a randomized study. *J Dev Behav.Pediatr* 1994;15(3):174-8.
- St James-Roberts I, Hurry J, Bowyer J, et al. Supplementary carrying compared with advice to increase responsive parenting as interventions to prevent persistent infant crying. *Pediatrics* 1995;95(3):381-8.
- St James-Roberts I, Alvarez M, Csapke E, et al. Infant crying and sleeping in London, Copenhagen and when parents adopt a "proximal" form of care. *Pediatrics* 2006;117(6):e1146-e1155.
- Anisfeld E, Casper V, Nozyce M, et al. Does infant carrying promote attachment? An experimental study of the effects of increased physical contact on the development of attachment. *Child Dev.* 1990;61(5):1617-27.
- Frisbee SJ, Hennes H. Adult-worn child carriers: a potential risk for injury. *Inj.Prev.* 2000;6(1):56-8.
- Stening W, Nitsch P, Wassmer G, et al. Cardiorespiratory stability of premature and term infants carried in infant slings. *Pediatrics* 2002;110(5):879-83.

Key points

- Studies of soft sling use have looked at outcomes of crying, attachment and safety. Most studies are small so strength of the evidence is limited.
- Sling use appears to be a safe practice, though lower oxygen levels were seen in babies who were still preterm so additional caution has been advised for this group.
- More holding and responsiveness is associated with less crying overall but not bouts of 'unsoothable crying'.
- Positive results from a small study showing that soft sling use has a positive impact on attachment and the responsivity of disadvantaged mothers suggest that further research in this area should be a priority.

Safe sling use

Bag-style slings have a deep pocket and an elasticated top with a strap to go across the wearer. These slings have not been shown to be safe as a few babies in the US have died in the sling. Some have been recalled or withdrawn but there may be second-hand bag slings available.

A bag-style sling is deeper than other slings and the shape makes it harder to ensure the baby can breathe easily. As noted in the article, most slings are safe to use, if they hold baby snugly. The Sling Guide website www.slingguide.co.uk recommends that babies are:

- **Tight to you**
- **In view at all times**
- **Close enough to kiss**
- **Able to keep chin off chest**
- **Supported with a straight back**

Next issue: Preparation for birth and beyond

NCT confirms its position as developer and provider of best practice perinatal education and support with the introduction of its new preparation for birth and beyond (PBB) programme.

As part of the development of PBB, NCT was at the centre of an expert reference group that worked with the Department for Health to establish an up to date, evidence-based perinatal programme.

NCT has built on the work initiated by the Department, and created a programme quality assured through the NCT College that explores six common themes with mothers and fathers-to-be: the development of my unborn baby; changes for me and us; our/my health and wellbeing; giving birth and meeting our baby; caring for my/our baby; and who is there for us – people and services.

Using tried and tested participatory teaching and learning methods, the new programme will help mothers and fathers acquire the practical skills they need to cope with labour and care for their baby, and an understanding of how to nurture their own relationship across the transition to parenthood and to co-parent their baby.

The next issue will explore NCT's PBB offering from both the policy and delivery perspective as it is rolled out through NCT's traditional classes route, as well as through the NHS and children's centres.