

“Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates” (2003), by Celeste Johnston, Bonnie Stevens, Janet Pinelli, Sharyn Gibbins, Francoise Filion, Anne Jack, Susan Steele, Kristina Boyer, and Annie Veilleux

In the 2003 article “Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates”, Celeste Johnston, Bonnie Stevens, Janet Pinelli, and their colleagues evaluate the effectiveness of the Kangaroo Mother Care position in decreasing the pain response of preterm infants who undergo a heel lance procedure for blood collection. Kangaroo Mother Care is a method of treatment for premature and low birth weight infants that involves exclusive breastfeeding and skin-to-skin contact between a mother and her infant in what is called the kangaroo position. After researchers supported the use of Kangaroo Mother Care for basic care, they began to search for other uses of Kangaroo Care in the neonatal intensive care unit, or NICU. In their article, the authors demonstrate that the skin-to-skin contact involved in the Kangaroo Mother Care decreased the amount of pain premature infants experienced during a heel lance, a frequently used NICU procedure.

Kangaroo Mother Care is a treatment designed for low birth weight and premature infants. A low birth weight infant weighs less than 2500 grams, or 5.5 pounds. Premature birth, or birth before thirty-seven weeks of gestation, is often related to low birth weight. Complications related to low birth weight include an infant’s inability to maintain body temperature, difficulty breathing, trouble gaining weight, long term problems with brain function, and sometimes death. Physician researchers Edgar Rey Sanabria and Héctor Martínez-Gómez first implemented the Kangaroo Mother Care treatment in Bogotá, Colombia in 1979. They developed it as an alternative method of care for low birth weight infants in places where access to incubators and other conventional care for premature infants were limited. After more studies of low birth weight supported the effectiveness of the Kangaroo Mother Care treatment, researchers began to evaluate its potential uses in other aspects of infant care.

As of 2018, researchers continue to study pain control in infants. Infants who are born prematurely or are experiencing the complications related to low birth weight are likely to be admitted to the neonatal intensive care unit or NICU. In the NICU, infants are constantly monitored and undergo medical testing that is often uncomfortable and painful. One of the most common procedures used in the NICU is the heel lance. During a heel lance, a trained practitioner warms an infant’s heel, cleans it with alcohol, and then makes a small puncture in the sole of the infant’s foot. The practitioner then gently squeezes the heel to collect blood for laboratory tests. The authors of “Kangaroo Care for Pain” aimed to evaluate the use of the kangaroo position, one aspect of Kangaroo Mother Care, for pain management in a NICU setting. They refer to the kangaroo position as Kangaroo Care throughout their article.

Johnston, Stevens, Pinelli, and their colleges published “Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates” in *The Archives of Pediatrics and Adolescent Medicine* in November 2003. Johnston was a registered nurse who researched the measurement and management of pain in infants. Stevens was also a registered nurse with her PhD. She researched the assessment and management of pain in preterm infants. Pinelli was a neonatal advanced practice nurse who researched pediatrics, family stress, and long-term outcomes for premature infants. Their other colleagues who contributed to the article were registered nurses and physicians in

Canada.

Johnston and her colleagues arrange “Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates” into four sections. They begin with an introduction to Kangaroo Care, describing it as skin-to-skin contact. The authors assert that Kangaroo Care could provide pain relief for infants being treated in NICUs and therefore physicians would not need to administer pain medications to infants. The authors then detail their study methods and discuss the Premature Infant Pain Profile, or PIPP, which they used to measure infant pain response. In the results section, they state that infants held in Kangaroo Care during a heel lance showed significantly lower pain response than infants who were lying on a cot during the procedure. Following the results, the authors comment on the implications of their findings. They also assert the need for research that studies which age-groups Kangaroo Care could effectively treat. Finally, they state that Kangaroo Care should be offered to mothers as a way to comfort their newborn during the heel lance procedure.

The authors begin “Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates” with an introduction to the Kangaroo Care treatment method. The authors describe Kangaroo Care as an skin-to-skin contact in which an infant, wearing only a diaper, is placed on its mother’s bare chest in an upright position. The authors’ description of Kangaroo Care covers only one aspect of the Kangaroo Mother Care method recommended by the World Health Organization, which also includes exclusive breastfeeding and early discharge from the hospital. The authors state that in the 2000s, when they conducted their study, Kangaroo Care was used in many NICUs throughout the world.

The authors report that studies of Kangaroo Care have shown that the method improves newborn neurobehavioral state regulation, which could improve the experience of pain. Newborn state regulation is the cycle of sleep and awake states which enables infants to control the amount of stimuli they receive from their environment. For example, when in quiet sleep, infants have a very high threshold to sensory stimuli and will be difficult to wake in comparison to an infant who is in active sleep. Premature infants have a harder time regulating their sleep and wake states than non-premature infants. The authors suggest that mothers can improve their premature infants’ state regulation through Kangaroo Care. According to the authors, previous studies demonstrated that Kangaroo Care helped infants sleep better and cry less while in the NICU and many months after discharge from the hospital. Johnston and her colleagues also suggest that the improvement in state regulation caused by Kangaroo Care could counter the negative effect pain has on their state regulation. Furthermore, they state that improved state regulation is associated with decreased pain response. Therefore, the authors believe that Kangaroo Care could decrease pain in infants during NICU procedures.

The authors then provide an explanation of the use of Kangaroo Care for pain management in premature infants. According to the authors, infants in NICUs undergo many painful, repetitive procedures each day, the most common of which is the heel lance. The authors state that the repetitive painful procedures can lead to negative long term consequences, but note that physicians often avoid administering pain medications which also pose many risks to small infants. Therefore, according to the authors, a method of medication-free pain control could be an asset to infant care. The authors argue that Kangaroo Care could provide that medication-free way to decrease infant pain while simultaneously engaging mothers in comforting their infants.

The authors describe their methods for data collection in the next section. The infants involved in Johnston and her co-researchers’ study were preterm infants born at three hospitals in Canada, including Hopital Sainte Justine in Montreal, Quebec, McMaster Children's Hospital in Hamilton, Ontario, and Sunnybrook and Women's College Health Sciences Centre in Toronto, Ontario. Qualifying infants were between thirty-two and thirty-six weeks postmenstrual age. Postmenstrual age is calculated as the time between the first day of the mother’s last menstrual period and the infant’s birth, or gestational age, plus the number weeks after the infant’s birth, or its chronological age. In order to qualify, the infants could not have any major health complications or need breathing assistance. The authors explain that they examined those infants within ten days of birth and that all were already undergoing heel lances for necessary medical studies. All infants served as their own controls, meaning their pain response to a heel prick while swaddled and lying on their stomach was compared to their pain response to a heel prick while in the Kangaroo Care position. During

the Kangaroo Care trial, infants were held in the position for thirty minutes before the heel lance and during the procedure.

As they continue, the authors detail that they used the Premature Infant Pain Profile, or PIPP, to quantify the amount of pain an infant experienced during the procedure. The infants received a score for their age, neurobehavioral state, frequency of three pain facial expressions, maximum heart rate, and minimum oxygen saturation. According to the authors, elevated heart rate and low oxygen saturation are indications that an infant is in distress. Johnston and her colleagues also detail how they used infant facial expressions, recorded on video, to determine frequency of brow bulge, eye squeeze, and nasolabial furrow, commonly called smile lines. For the authors, those facial expressions indicate that the infant is experiencing pain.

After describing the methods of their study, the authors outline the results of the seventy-four infants they studied. Johnston, Stevens, Pinelli, and their colleagues report that the overall infant pain scores for the Kangaroo Care trial were significantly lower at thirty seconds, sixty seconds, and ninety seconds after the heel lancing procedure. That means that the infants in Kangaroo Care experienced less pain throughout the procedure than they did in the control condition. The authors include a table showing the decreased PIPP scores up to 120 seconds after the painful procedure. During the procedure, both heart rate and oxygen saturation were similar between the control conditions and Kangaroo Care. However, the authors report that the frequency of pain response facial expressions decreased 20 percent while the infants were in Kangaroo Care. The authors include a graph showing the frequency of pain response facial expressions for both the Kangaroo Care and control groups. It shows a steep increase in pain response facial expressions at the time of heel-lance for both groups, with the control group having higher frequency of pain response at all times. The infants in Kangaroo Care showed such a decrease in painful facial expressions that it led to an overall lower PIPP score, despite similarities in maximum heart rate and oxygen saturation between groups. The authors conclude that their data indicates that Kangaroo Care is able to decrease the pain response in infants undergoing a heel lance.

The authors discuss the implications of their results and the need for further research. Johnston, Stevens, Pinelli, and their colleagues state that their study may be the first to provide evidence for the use of Kangaroo Care for pain management in premature infants. They suggest further research on Kangaroo Care for pain management in younger infants, for the use of Kangaroo Care instead of other procedures, for use with older infants and toddlers, and for use with infants who have more complicated medical issues.

Next, the authors discuss some variables that may have impacted the study results. First, they address the impact that different infant positions, like lying on the stomach versus kangaroo position, could have on the health care provider's ability to draw blood. The authors state that the providers experienced more difficulty in drawing blood from infants in the Kangaroo Care position. The authors explain that could mean that infants in Kangaroo Care may have experienced more pain than the control, yet they still showed a decreased pain response. Secondly, Johnston and her colleagues state that there may be some bias in the maternal sample studied because the mothers who volunteered may have been more comfortable holding their infants in the Kangaroo Care position than the mothers who chose not to participate in the study. Therefore, other mothers may not provide the same level of benefit to their infants in Kangaroo Care as those who participated.

At the end of their article, the authors address some mothers' concerns that their infants could become conditioned to expect painful stimuli while in Kangaroo Care. The authors present research evidence that indicates infants can anticipate painful experiences when they are exposed to uncomfortable stimuli, such as the smell of alcohol or during specific body handling, but they argue that Kangaroo Care is a comfortable setting and should not condition infants to expect pain. Finally, the authors argue that it is appropriate to offer Kangaroo Care to mothers who want to comfort their stable infants during heel-lancing procedures.

The authors of "Kangaroo Care Is Effective in Diminishing Pain Response in Preterm Neonates" demonstrate that Kangaroo Care can be a useful treatment for pain experienced by premature infants during NICU procedures. Many other studies evaluating Kangaroo Care as a method of pain management have cited the article. In 2014, Johnston led a Cochrane Database Systematic

Review of skin-to-skin care for pain management, further supporting the results of the article. In 2016, the American Academy of Pediatrics released an update to their "Prevention and Management of Procedural Pain in the Neonate" that recommends the use of Kangaroo Care for procedural pain management in infants.

Sources

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