Impact of kangaroo care (skin-to-skin contact) on attachment formation between preterm infants and their caregivers

Cindi Johnson
Pacific University

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Disciplines
Occupational Therapy | Pediatrics

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Impact of kangaroo care (skin-to-skin contact) on attachment formation between preterm infants and their caregivers.

Prepared by: Cindi Johnson, OTS (email: john8805@pacificu.edu)
Date: December 6, 2010
Review Date: December 6, 2012

**CLINICAL SCENARIO:**
An infant is born prematurely at 29 weeks gestation. He is immediately separated from his mother and taken away to the NICU. When the mother next sees her son, he is in an incubator being mechanically ventilated. He is being fed through a nasogastric tube and is hooked up to a pulse oximeter and a cardiorespiratory monitor. A nurse is taking care of his every need. The tiny, helpless infant all “wired up” and this high tech environment is very shocking, overwhelming, and intimidating to his mother. The normal pregnancy and birth stages were unexpectedly interrupted and all of the typical parent role responsibilities (e.g. provider, protector, caregiver) no longer apply. The mother feels disconnected from her son, not needed in his care, and is afraid to touch him. The occupational therapist (OT) approaches the case from a family centered perspective to address the needs of both the medically fragile preterm infant and his mother. The OT is familiar with kangaroo care (KC) and the physiological benefits it can provide to the infant and this NICU is supportive of the practice with infants of his particular level of acuity. The OT is aware of how positive attachment can influence an infant’s development and that such an attachment is at risk in this case. The OT considers whether KC is an effective intervention to encourage a connection between the mother and her preterm son. According to the Centers for Disease Control and Prevention, in 2007 in the U.S. 13% or 546,602 of infants were born preterm. Given the significant prevalence rate of preterm births, it is worth investigating KC and its impact on an infant’s main occupation, bonding.

**FOCUSED CLINICAL QUESTION:**
How does kangaroo care (skin-to-skin contact) affect attachment formation between preterm infants and their caregivers?

**SUMMARY of Search, ‘Best’ Evidence appraised, and Key Findings:**
- A total of 5 research articles investigating the effects of KC on attachment formation were analysed.
- The study by Feldman, Eidelman, Sirota, and Weller (2002) was deemed the ‘best evidence’ evaluated.
- The cohort study examined the effects of KC intervention with preterm infants on parent-child interactions and infant development across the first 6 months of life.
- The study included a large sample size (N=146) and participants were representative of the general population. Institutional research boards prohibited randomization as KC is a standardized care option in many hospitals where the study took place. Thus, a two hospital design was implemented to eliminate ethical issues (they pulled from 2 different hospitals and recruited families with similar demographics to help minimize possible selection bias).
- The study design controlled for the infant’s medical status (infant pairs [KC and control] were matched for medical risk).
- Statistically significant findings in 6/7 outcome areas relevant to OT practice.
- The study showed KC has long-term impact (through the first 6-months) and positively contributes to 3 aspects of early development (maternal and paternal perceptions,
Maternal and paternal behaviors, and infant development) independent of the infant’s medical status.

- Findings reported by Anderson et al. (2003) suggest KC increases the mothers’ desire to hold their infants. KC group held their infants 42.9% of the time versus control mothers who held their infants 20% of the time.
- Neu and Robinson’s (2010) study reports KC holding may promote resilience in the infant-mother relationship to manage stress or novelty with ease.
- Case studies by Parker and Anderson (2002) and Swinth, Nelson, Hadeed, and Anderson (2000) report personal experiences that contribute to the literature in support of KC.

**CLINICAL BOTTOM LINE:**
NICUs are directed to support the social and emotional needs of parents and their high-risk, preterm infants. KC appears to be a successful intervention for addressing these needs and promoting attachment formation. It is an intervention that is easy to administer, cost-effective, and appears to have no negative side effects when implemented with medically stable infants. KC intervention is relevant to OT practice in that it specifically addresses an infant’s primary occupation, bonding.

**Limitation of this CAT:** The research conducted for this CAT was not complete or exhaustive. This critically appraised paper was prepared by a master’s of occupational therapy student as part of a university project. It was reviewed by a faculty member, but has not been externally peer-reviewed.

**SEARCH STRATEGY:**
Terms used to guide Search Strategy:
- **Patient/Client Group:** Preterm infants and their caregivers
- **Intervention (or Assessment):** Kangaroo care (skin-to-skin contact)
- **Comparison:** Null
- **Outcome(s):** Attachment formation

<table>
<thead>
<tr>
<th>Databases and sites searched Oct. 2010</th>
<th>Search Terms</th>
<th>Limits used</th>
</tr>
</thead>
<tbody>
<tr>
<td>PsychINFO</td>
<td>“kangaroo care”</td>
<td>Full text only AND English language</td>
</tr>
<tr>
<td>CINAHL</td>
<td>“kangaroo care” AND “premature infants”</td>
<td>Full text only AND English language</td>
</tr>
<tr>
<td>Evidence-Based Medicine Reviews Multifile</td>
<td>“kangaroo care”</td>
<td>Full text only AND English language</td>
</tr>
<tr>
<td>MEDLINE – OVID</td>
<td>“kangaroo care” AND “premature infants”</td>
<td>Full text only AND English language</td>
</tr>
<tr>
<td>OT Search</td>
<td>“kangaroo care”</td>
<td>No limits</td>
</tr>
</tbody>
</table>

Prepared by C. Johnson (December 6, 2010). Available at [http://commons.pacificu.edu/otcats/](http://commons.pacificu.edu/otcats/)
INCLUSION and EXCLUSION CRITERIA:

- **Inclusion:**
  - peer reviewed articles in English and available in full text
  - KC as the intervention
  - preterm infants and their caregivers as the participants
  - attachment formation outcome primarily examined
  - both quantitative and qualitative studies were considered
- **Exclusion:**
  - healthy and/or full term infants
  - all other interventions

RESULTS OF SEARCH:
5 relevant studies were selected and categorised as shown in Table 1 (based on Oxford Centre for Evidence-based Medicine Levels of Evidence, May 2001)

Table 1: Summary of Study Designs of Articles retrieved

<table>
<thead>
<tr>
<th>Study Design/ Methodology of Articles Retrieved</th>
<th>Level</th>
<th>Number Located</th>
<th>Author (Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort study</td>
<td>II</td>
<td>1</td>
<td>Feldman, Eidelman, Sirota, and Weller (2002)</td>
</tr>
</tbody>
</table>

BEST EVIDENCE:

The following study/paper was identified as the ‘best’ evidence and selected for critical appraisal.


Reasons for selecting this study were:

- The study directly addresses the clinical question.
- The study examines multiple outcomes areas relevant to OT practice.
- The study looked at effects of KC beyond what is seen immediate post birth in the NICU.
• The study was well designed to minimize selection bias and control for confounding variables while eliminating ethical issues.
• Participants were representative of the general population.

SUMMARY OF BEST EVIDENCE:

Table 2: Description and appraisal of the study by Feldman, Eidelman, Sirota, & Weller (2002).

**Aim/Objective of the Study:** To examine the effects of KC intervention with preterm infants on parent-child interactions and infant development across the first 6 months of life.

**Study Design:** This cohort study design was appropriate to study the effectiveness of KC treatment. Participants were 146 premature infants recruited from 2 separate but clinically similar hospitals (Hospital A did not provide KC care initially and Hospital B already provided KC care). 73 infants underwent KC (55 from Hospital B and 20 from Hospital A after implementing KC) and 73 infants served as controls (all from Hospital A). Infants in the two groups were matched based on a variety of criteria to control for confounding factors. Seven groups of outcomes were measured at 3 time periods: 37 weeks’ gestational age, 3-months, and 6-months.

Institutional research boards prohibited randomization as KC is a standardized care option in many hospitals in Israel. Thus, the two hospital design was implemented eliminating ethical issues. Pulling from 2 different hospitals and recruiting from families with similar demographics helped minimize possible selection bias.

**Setting:** Two hospitals that were level 3 referral centers with a comparable number of admissions, case mix, physician level and experience, and nurse-patient ratios. Both nurseries had similar physical environments and in both parents had unlimited privileges and were encouraged to be active participants in their child’s care.

**Participants:** Sample included 73 pairs (N=146) of premature infants admitted to the NICU whose mean birth weight was 1270g and mean gestational age was 30.65 weeks matched for gender, birth weight, gestational age, and medical risk. Families were also matched for maternal and paternal age, education, parity, and maternal employment.

Families were all middle-class, representing the majority of young families in the Israeli population. All mothers were married to the child’s father and at least 1 parent was employed.

Infants with grade 3 or 4 IVH, perinatal asphyxia, ventilation, or metabolic genetic disease were excluded. Infants whose mothers smoked, used drugs, or who were recent immigrants were also excluded.

Consecutive mothers who delivered in the 2 hospitals and who matched the study criteria were approached in each hospital to enroll in the study as soon as their infants became eligible per the criteria outlined above.

The study received the approval of the institutional research board and all mothers provided signed informed consent.
Dropouts reported:
- 12 infants missed the 3-month visit
- For 14 infants, fathers were not present during the 3-month visit
- 13 infants missed the 6-month visit
Reasons noted inability to locate parents, families moving to a far location, and time and scheduling difficulties.

**Intervention Investigated:**

*Control:* The control group was provided standard care only.

*Experimental:* Mothers had to agree to at least 1 hour of KC for at least 14 consecutive days. Medically stable infants who were no longer being ventilated were taken out of the incubator, undressed (wearing only a diaper and sometimes a cap), and placed between the mother’s breasts. During KC, infants remained attached to a cardiorespiratory monitor and were observed by the nurses, who recorded the exact time that mothers and infants remained in skin-to-skin contact. Mothers were seated in a standardized rocking chair and were provided a bedside screen to ensure privacy. No change in ambient light or sound level was performed during KC.

**Outcome Measures:** Outcomes were measured at 37 weeks gestational age before discharge from the hospital and at home at 3-months and 6-months of age.

Outcome areas examined:
*At 37 weeks:*
  - mother-infant interaction
  - maternal depression
  - mother perceptions

*At 3-months:*
  - infant temperament
  - maternal and paternal sensitivity
  - home environment

*At 6-months:*
  - cognitive development
  - mother-infant interaction

Measures used:
*At 37 weeks:*
  - Mother-Newborn Coding System used to code interactions from taped 10 minute session to achieve an overall rating of several behaviors along 5 categories.
  - Beck Depression Inventory (BDI)
  - Neonate Parental Inventory

*At 3-months:*
  - Home Observation for the Measurement of the Environment (HOME)
  - Infant Characteristics Questionnaire including the Fussy-Difficult factor

*At 6-months:*
  - Bayley-II
  - Coding Interactive Behavior based on 5 minutes of videotaped mother-infant interaction.

**Main Findings:** To analyse the multiple dependent variables, each of the 7 outcome clusters (noted below) were examined with a separate multivariate analysis of variance (MANOVA) with intervention (KC, control) and medical risk (high, low) as the between-subject factors.
Univariate analysis of variance followed significant main effect findings on the MANOVA, and post hoc comparisons followed significant interaction effects. In brief summary, the results are:

**At 37 weeks predischarge:**
- mother-infant interaction: MANOVA conducted showed an overall effect for KC intervention (P<.001) indicating more positive interactions in the KC group (e.g. more frequent gazing and touching, more positive affect, and more adaptive to the infants signals).
- mother perceptions: MANOVA conducted for the 2 maternal self-report measures (BDI, NPI) revealed an overall positive effect for KC intervention (P<.001). KC mothers reported less depressive symptoms and perceived the infant as more normal and less divergent from the “average infant.”

**At 3-months in the home:**
- HOME mothers: MANOVA showed an overall effect (P<.01) for KC intervention indicating that KC mothers provided a better home environment than non-KC mothers.
- HOME fathers: MANOVA showed an overall effect (P<.05) for KC intervention indicating that KC fathers provided a better home environment than non-KC fathers.
- infant temperament: MANOVA revealed no significant effect of KC intervention.

**At 6-months in developmental lab:**
- infant cognitive development: MANOVA showed a significant overall effect (P<.01) for intervention indicating improved infant development in the KC group.
- mother-infant interaction: MANOVA revealed an overall effect for the KC intervention (P<.05) suggesting that mother-infant interactions were more optimal in the KC group.

**Original Authors’ Conclusions:** The study showed KC has long-term impact (through the first 6-months) and positively contributes to 3 aspects of early development (maternal and paternal perceptions, maternal and paternal behaviors, and infant development) independent of the infant’s medical status (infant pairs (KC and control) were matched for medical risk). NICU interventions should support increased “emotional investment in the parenting process among mothers of very sick preterm infants, and our results suggest that KC is a successful intervention for achieving this goal” (p. 24).

**Critical Appraisal:**

**Validity:**
- The authors focused on a specific clinical question.
- Relevant background literature was reviewed and included in the study.
- The design of the study was appropriate to address the clinical question while addressing ethical issues. The design controlled for the infant’s medical risk.
- The sample size was adequate and included specific inclusion and exclusion criteria. Control and experimental pairings were matched across a variety of categories and both groups were representative of the general population. Drop outs were reported on.
- Reliable instruments were used to measure outcomes. Trained research assistants and psychologists who were unaware of the infant’s group assignment administered the assessments.
- The main analysis methods of the results were appropriate with MANOVAs conducted to show overall effects. Statistical significance was reported for outcomes using p-values.
**Interpretation of Results:** The authors conducted a well designed and thorough examination of the long term effects of KC. It looked at several different areas related to attachment formation in a variety of environments: hospital, home, and lab. The study design minimized as much selection bias as possible while addressing the ethical issues that precluded it from utilizing random assignment of participants. The study did not report on the amount of support and attention the participants received during KC (from staff) and it did not seem to be controlled for. Authors contributed to the literature in support of KC as a valuable intervention with preterm infants and made recommendations for future research.

**Summary/Conclusion:** Families faced with the medical challenges that present with a preterm birth are often caught unprepared. The high tech environment and their tiny child can be intimidating. Attachment formation is a critical piece to both parties in the relationship healing and overcoming associated obstacles. Feldman et al. (2002) examined the long term impact of the therapeutic intervention, KC. The authors reported significant findings, which contribute to literature in support of this practice. KC appears to be a successful intervention for promoting attachment formation. It is easy to administer, cost-effective, and appears to have no negative side effects when implemented with medically stable infants. Further follow up and research should be conducted to determine if gains persist into later childhood. Similar studies should be conducted in the U.S. to determine if similar findings result (compared to Israeli culture). Family dynamic variables, such as the existence of older siblings, should also be factored into study designs.
Table x: Characteristics of included studies

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<tbody>
<tr>
<td>Intervention investigated</td>
<td>KC in the first 48 hours</td>
<td>8-week nurse supported KC program</td>
<td>KC with adoptive parents</td>
<td>KC with triplets</td>
</tr>
<tr>
<td>Comparison intervention</td>
<td>Blanket wrapped holding (standard care)</td>
<td>8-week nurse supported traditional holding program and a control group that received no specific support</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Outcomes used</td>
<td>-Index of Mother-Infant Separation -Mother completed contact log</td>
<td>-Demographic questionnaires -The Hollingshead Four Factor Index -The Center for Epidemiologic Studies Depression Scale -The State-Trait Anxiety Inventory -The Still-Face Paradigm -Infant Regulatory Scoring System</td>
<td>Participant self report, including direct quotations, that thoroughly explained what it was like for these adoptive parents to provide KC to their critically ill 27-week old daughter.</td>
<td>Mother's self report of experiences with shared KC. It included descriptions and direct quotations that explained what it was like for her and her triplets.</td>
</tr>
<tr>
<td>Findings</td>
<td>KC group held their infants 42.9% of the time versus control mothers who held their infants 20% of the time. Findings suggest KC increases the mothers’ desire to hold their infants.</td>
<td>Results suggest that KC dyads developed a positive way to repair mismatched affective states (when responses and interpretations of the dyad are not always coordinated) as seen in the number of positive symmetry interactions displayed post the stressful neutral face phase (p=0.022). KC holding may promote resilience in the infant-mother relationship to manage stress or novelty with ease</td>
<td>The study provides an example of one adoptive couples’ experience with KC and how they felt it positively impacted bonding with their preterm daughter. The report of their experience adds to the available literature in support of KC.</td>
<td>The study provides an example of one mother's experience with KC and how she felt it positively impacted bonding with her preterm triplets. The report of her experience adds to the available literature in support of KC.</td>
</tr>
</tbody>
</table>
IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

The five studies reviewed conclude overall support of KC as an attachment facilitator as evidenced by quantitative and qualitative findings. KC is an intervention that has proven physiological benefits and increased research supports its psychosocial benefits as well. There has been a trend in increased multiple births, many of whom are born prematurely, and medical advances have increased the survival rate of premature infants. With this population growing, there will be a demand for professionals to meet this specialized group’s requirements satisfactorily through family-centered care. KC is a natural fit within the realm of occupational therapy practice as it addresses both the needs of the child and the needs of their family.

Preterm birth disrupts the typical process and roles of parenting. Bonding is challenged and, if not achieved, can lead to developmental issues. Symmetry that forms in the early weeks of life persists several months later (Neu & Robinson, 2010). KC appears to be an intervention that will encourage attachment formation between preterm infants and their caregivers. According to a study by Engler et al. (2002), 82% of 537 NICU hospital survey respondents in the United States reported practicing KC in their NICUs. Major barriers were infant safety concerns as well as reluctance by nurses, physicians, and families to initiate or participate in KC. It is easy to administer, cost-effective, and appears to have no negative side effects when implemented with medically stable infants. It appears that to encourage the practice of KC, additional education needs to be offered to relevant hospital staff (including OTs) and to families of infants in the NICU. Education should highlight the knowledge and skills needed to provide KC safely and effectively. The value of KC to infants and parents should also be emphasized.

The studies reviewed were all completed by nursing professionals. This writer’s non-exhaustive search did not find any journal articles that included occupational therapists among the authors on the topic of KC and attachment formation with the preterm infant population. Future research on this topic should be undertaken by occupational therapists to provide their unique perspectives. Research could examine how KC might encourage attachment formation with other populations of infants that also may present a challenge to the bonding process (e.g. other reasons for NICU admission, developmental disability, physical disability, and/or those with a congenital disease). Research could examine how KC might encourage attachment formation with other populations of caregivers who might present a challenge to the bonding process (e.g. teenage parents, grandparents, mothers with postpartum depression, and/or foster parents). Research could also examine the different environments in which KC may be offered outside of the hospital setting and it could compare KC to more traditional interventions.
REFERENCES


