CRITICALLY APPRAISED TOPIC

FOCUSED CLINICAL QUESTION

Among mothers of hospitalized preterm infants (P), does the use of infant massage techniques (I) lead to decreased stress in the mother as measured through changes in salivary cortisol levels (O) as compared to the use of skin to skin contact/kangaroo care (C)?

AUTHOR

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CLINICAL SCENARIO

During my acute rotation, I had some exposure to NICU physical therapy. Two of our patients were in the NICU for the entire duration of my rotation (8 weeks), so I became very familiar with them. However, contrary to what I had seen during my outpatient pediatrics where parent communication/education was such a big part of our role, I never saw the parents of either of these patients. Their nurses sometimes communicated concerns the parents had related to motor development/physical therapy, and we would have to do our best to provide the nurses with education to relay back to the parents and hope it would be sufficient. This made me curious about the role of parent education, not only in promoting the motor development of an infant, but also in increasing the confidence levels of the parent. During the treatment sessions I observed in the NICU, PTs often used containment to help calm the baby, which made me curious about the use of different techniques to help calm the baby via touch.

In pediatrics (especially with infants), involvement of parents is crucial to ensuring optimal outcomes from physical therapy. It is important that as therapists we ensure that we are taking steps to empower the parents, increase their confidence in caring for their children, and decrease their stress levels, as this helps facilitate improved motor development. Kangaroo care is a technique that helps parents interact with their premature infants becomes it less popular as infants get bigger, so infant massage techniques could be a technique that therapists can teach and that parents can use more long term if it is found to be beneficial.

SUMMARY OF SEARCH

[Best evidence appraised and key findings]

After reviewing the literature, 8 articles were found that fit the criteria for this search, including 3 randomized controlled trials, 3 quasi-experimental studies, 1 integrative review, and 1 narrative review.

It appears that both infant massage and kangaroo care lead to decreased stress levels in mothers of preterm infants, but current research does not indicate that one intervention is more effective than the other.[1-3,5-7]

Research also indicates decreased depressive symptoms in mothers after completing infant massage as compared to kangaroo care or no intervention.[3,5]

Some research indicates that the use of either infant massage or kangaroo care may help improve mother-infant attachment, although results on this topic are mixed and warrant further study.[3,5,6,8]

CLINICAL BOTTOM LINE

It does not appear that utilizing infant massage leads to increased benefits as compared to kangaroo care with respect to maternal stress levels, although both interventions do decrease levels of maternal stress in mothers of hospitalized, preterm infants.[3,5] However, infant massage does lead to other maternal psychological benefits, such as reduced risk for postpartum depression or more rapid decline in depressive symptoms in these mothers, and an improved social-emotional home environment when compared to kangaroo care.[3,5] Therefore, infant massage still poses a potential clinical benefit for mothers of preterm infants and should be considered a viable treatment option to be used in either in conjunction with or as a replacement for kangaroo care as infants age.

This critically appraised topic has been individually prepared as part of a course requirement and has been peer-reviewed by one other independent course instructor

The above information should fit onto the first page of your CAT

SEARCH STRATEGY

Terms used to guide the search strategy			
Patient/Client Group	**I**ntervention (or Assessment)	**C**omparison	**O**utcome(s)
Mother of preterm infant Mother of hospitalized infant NICU parent Postpartum mother Mother	Massag* Manual therapy Physical therapy Rehabilitation Physiotherapy	Skin to skin Skin to skin contact Kangaroo care	Stress Cortisol

1. mother of preterm infant OR mother of hospitalized infant OR NICU parent OR postpartum mother OR mother
2. (massag* OR manual therapy) AND (physical therapy OR rehabilitation OR physiotherapy)
3. skin to skin OR skin to skin contact OR kangaroo care
4. stress AND cortisol
5. #1 AND #2 AND #3 AND #4

Final search strategy (history):

Show your final search strategy (full history) from PubMed. Indicate which "line" you chose as the final search strategy.

#11	Search: **(((((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother)) AND (massag* OR manual therapy OR physical therapy OR rehabilitation OR physiotherapy)) AND (skin to skin OR skin to skin contact OR kangaroo care)) AND (stress OR cortisol)** Filters: **from 2000 - 2021**	23
#9	Search: **(((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother) AND ((massag* OR manual therapy) AND (physical therapy OR rehabilitation OR physiotherapy))) AND (skin to skin OR skin to skin contact OR kangaroo care)) AND (stress OR cortisol)**	4
#8	Search: **stress OR cortisol**	1,177,749
#7	Search: **massag* OR manual therapy OR physical therapy OR rehabilitation OR physiotherapy**	894,206
#6	Search: **((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother) AND ((massag* OR manual therapy) AND (physical therapy OR rehabilitation OR physiotherapy))) AND (stress AND cortisol)**	2
#5	Search: **preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother**	259,709
#4	Search: **stress AND cortisol**	22,907
#3	Search: **skin to skin OR skin to skin contact OR kangaroo care**	855,799
#2	Search: **(massag* OR manual therapy) AND (physical therapy OR rehabilitation OR physiotherapy)**	25,980
#1	Search: **mother of preterm infant OR mother of hospitalized infant OR NICU parent OR postpartum mother OR mother**	259,709

#12	•••	Search: **(((((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother)) AND (massag* OR manual therapy OR physical therapy OR rehabilitation OR physiotherapy)) AND (skin to skin OR skin to skin contact OR kangaroo care)) AND (stress OR cortisol)** Filters: **from 2010 - 2021**	17
#10	•••	Search: **(((((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother)) AND (massag* OR manual therapy OR physical therapy OR rehabilitation OR physiotherapy)) AND (skin to skin OR skin to skin contact OR kangaroo care)) AND (stress OR cortisol)**	25
#18	•••	Search: **(((((preterm infant mother OR hospitalized infant mother OR NICU parent OR postpartum mother OR mother)) AND (massag* OR manual therapy OR physical therapy OR rehabilitation OR physiotherapy)) AND (skin to skin OR skin to skin contact OR kangaroo care)) AND (stress OR cortisol)** Filters: **Books and Documents, Clinical Trial, Meta-Analysis, Randomized Controlled Trial, Review, Systematic Review**	8

Final search strategy is #11

I used the final search strategy from PubMed in the other databases (other than PEDro) and then applied the publication date/original language of English filters. For PEDro, I filled out the relevant categories using my P/I/C/O search terms. I also utilized MeSH terms in PubMed for many of the search terms, including preterm infant, hospitalized, NICU, postpartum, manual therapy, physical therapy, and cortisol.

Additional searches (explained below):

#33	•••	Search: **preterm mother AND kangaroo care AND maternal stress**	42
#32	•••	Search: **preterm mother AND massage AND maternal stress**	10

In the table below, show how many results you got from your search from each database you searched.

Databases and Sites Searched	Number of results	Limits applied, revised number of results (if applicable)
PubMed	**25**	**Publication date: 2000-present → 23** **(Additional PubMed searches – see below – yielded 10 and 40 results, respectively)**
CINAHL	**6**	**Eliminating duplications from PubMed → 3**
PSYCInfo	**6**	**Eliminating duplications from PubMed → 3**
PEDro	**7**	**Publication date: 2000-present → 6; Article originally written in English → 5**
Embase	**12**	**Eliminating duplications from PubMed → 7**

INCLUSION and EXCLUSION CRITERIA

Inclusion Criteria
Systematic reviews, meta-analyses, randomized controlled trials, clinical trials, literature reviews
Intervention performed while infants still hospitalized
Intervention performed on preterm infants
Intervention taught by physical therapist, occupational therapist, or nurse
Mother actively participating in massage/manual therapy intervention

Mother involved in studies is the patient's biologic mother Studies published in English Published after 2000 Stress measured via cortisol levels or self-report
Exclusion Criteria
Case studies, abstracts, dissertations, poster presentations, textbooks Intervention performed after infant discharged from hospital Intervention performed on hospitalized infants (all term infants or mix of term and preterm)

RESULTS OF SEARCH

Summary of articles retrieved that met inclusion and exclusion criteria

For each article being considered for inclusion in the CAT, score for methodological quality on an appropriate scale, categorize the level of evidence, indicate whether the relevance of the study PICO to your PICO is high/mod/low, and note the study design (e.g., RCT, systematic review, case study).

Author (Year)	Risk of bias (quality score)	Level of Evidence**	Relevance	Study design
Letzkus L., Alonzo C., Connaughton E., Kelly N., & Zanelli S. (2021)	**JBI Critical Appraisal Checklist for quasi-experimental studies – 5/9**	**4 – study with less rigorous design; graded down for poor design (quantitative)**	**Low**	**Quasi-experimental study (Single group pretest-posttest design)**
Pineada R., Guth R., Herring A., Reynolds L., Oberle S., & Smith J. (2017)	**QATSDD – 35/48**	**3 – descriptive study (qualitative)**	**Moderate**	**Integrative review**
Holditch-Davis D., White-Traut R., Levy J., O'Shea M., Geraldo V., & David R. (2014)	**PEDro – 6/10**	**2 – individual study with strong design (quantitative)**	**High**	**Randomized controlled trial**
Pados B. (2019)	**QATSDD – 10/42**	**4 – descriptive study; graded down for poor design (qualitative)**	**Low**	**Narrative review**
Xie J., Zhu L., Zhi T., Jian Y., Ding Y., Zhou M., & Feng X. (2019)	**PEDro – 7/10**	**2 – individual study with strong design (quantitative)**	**High**	**Randomized controlled trial**
Cho E-S., Kim S-J., Kwon M., Cho H., Kim E., Jun E., & Lee S. (2016)	**JBI Critical Appraisal Checklist for quasi-experimental studies – 7/9**	**3 – study with less rigorous design (quantitative)**	**Low**	**Quasi-experimental study (non-equivalent comparison group design)**
Afand N., Keshavarz M., Fatemi N., & Montazeri A. (2017)	**JBI Critical Appraisal Checklist for quasi-experimental studies – 7/9**	**3 – study with less rigorous design (quantitative)**	**Moderate**	**Quasi-experimental study (nonrandomized controlled trial)**

Vittner D., McGrath J., Robinson J., Lawhon G., Cusson R., Eisenfeld L., Walsh S., Young E., & Cong X. (2018)	**PEDro – 4/10**	**3 – study with less rigorous design**	**Low**	**Randomized controlled trial**

**From Portney Table 36-1: Summary of Levels of Evidence (2020).

BEST EVIDENCE

The following 2 studies were identified as the 'best' evidence and selected for critical appraisal. Rationale for selecting these studies were:

- **Holditch-Davis D., White-Traut R., Levy J., O'Shea M., Geraldo V., & David R. (2014)[3]:** This article was selected because it had high relevance to the clinical question being asked, which was uncommon among the articles. This was an RCT, which was the highest methodological quality identified in the literature review, as there were no systematic reviews or meta-analyses found on the topic. It had groups for both the intervention and comparison in the PICO question, as well as a control group. Additionally, when looking at the areas where the study lost points on the PEDro scale, 3 of the 4 points where related to blinding, which is extremely difficult to conceal in this type of research. Subjects and therapists administering the therapy could not be blinded to the intervention as they were instructing parents in the intervention or completing the intervention themselves. Additionally, they could not receive credit for blinding assessors who measured outcomes, as the subjects provided self-report scores for some of the outcomes. Assessors for any other outcomes, such as video coding to determine mother-infant relationship, were blinded to the intervention group. The last area this article lost points for on the PEDro scale was for having complete data for less than 85% of their initial sample; this was another area that was hard to control, as some of the subjects were lost due to infant death or change in medical condition. No studies, including this one, assessed stress levels based on cortisol levels, but this study used a multitude of self-report measures to assess stress in different ways.
- **Xie J., Zhu L., Zhi T., Jian Y., Ding Y., Zhou M., & Feng X. (2019)[5]:** This article was also selected due to its high relevance to the clinical question and strong methodological quality in comparison to the other studies. Additionally, it had a very high score on the PEDro scale (highest of all RCTs included in analysis). Similar to the article above, two of the points lost were due to lack of blinding of the subjects and therapists, which was also not possible due to their involvement in direct provision of the intervention. However, they did state that all assessors were blinded to group assignment, which was a plus for this study. While assignment to intervention groups was randomized, it was unclear if allocation to groups was concealed, which was the other area that this study lost points for on the PEDro scale; this is another very common area to lose points on the PEDro scale. This study also benefitted from the addition of a 12 month follow up, allowing determination of if intervention results persisted over time. This study did not fit the clinical question quite as well as the first article selected, as this group had one group performing skin to skin contact (defined as standard care) and one group performing skin to skin contact AND infant massage; however, it was still one of the only articles that directly compared the two interventions with quantitative data to back up the comparisons (although no cortisol measure to assess stress) and was still of the highest methodological quality of appraised studies, making it part of the best available evidence.

SUMMARY OF BEST EVIDENCE

(126) **Description and appraisal of (Maternally administered interventions for preterm infants in the NICU: Effects on maternal psychological distress and mother-infant relationship) by (Holditch-Davis et al., 2014)**

Aim/Objective of the Study/Systematic Review:
The aim of this study was to evaluate and compare the potential benefits of kangaroo care and infant massage [auditory, tactile, visual, and vestibular intervention (ATVV)], which are already known to benefit preterm infants in the neonatal intensive care unit (NICU), in helping reduce maternal psychological distress and improve the mother-infant relationship during the NICU stay.
Study Design
[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]

Note: For systematic review, use headings 'search strategy', 'selection criteria', 'methods' etc. For qualitative studies, identify data collection/analyses methods.

This was a randomized controlled trial of preterm, hospitalized infants and their mothers, with 240 mother-infant dyads comprising three groups: a kangaroo care group, an ATVV group, and an attention control group. A statistician created a random schedule prior to recruitment that was used to assign mother-infant dyads to groups; group assignment was also stratified based on hospital and singleton vs. multiple births to help minimize group differences.

Study nurses who provided the interventions could not be blinded to group assignment as they had to teach the mothers their assigned interventions. Additionally, mothers could not be blinded as they had to provide the interventions, but they were asked not to talk to any other mothers about the interventions so that mothers only knew their intervention and not if they were in a control or intervention group. However, all data collectors or coders were blinded to group assignment as much as possible (with video coding of the intervention sessions it was not possible to be blinded to assignment but only two assessors coded videos).

All mother-infant dyads were followed from the time of enrollment until the infants reached 12 months corrected age. The intervention was provided from the time of enrollment until the infants reached 2 months corrected age. The following outcomes were evaluated at these time points:

	Enrollment	**During Intervention**	**Discharge**	**2 months***	**6 months***	**12 months***
Infant-predominant sleep-wake state		**X**				
Maternal psychological distress	**X**			**X**	**X**	**X**
Infant responsiveness			**X**			
Maternal perceptions of the infant	**X**			**X**	**X**	**X**
Mother-infant interaction				**X**	**X**	
Social-emotional aspects of home environment				**X**	**X**	
Demographics	**X**		**X**	**X**	**X**	**X**

*All corrected age of the infant

All mother-infant dyads were analyzed based on their group assignment, regardless of what interventions mothers actually performed with their infants (more information below). Missing data was not replaced unless over 75% of the scores on the item were available, in which case the missing scores were scored as the mean of the other items. Generalized linear mixed models were used for all longitudinal analyses, and analyses were completed using SAS Proc Mixed and $p < .05$ was set as the level for significance.

Setting

[e.g., locations such as hospital, community; rural; metropolitan; country]

This study was completed at two urban/suburban North Carolina hospitals and two urban Illinois hospitals, with some follow up visits completed in the home (2 and 6 month visits) and in NICU follow-up clinics (12 month visit).

Participants

[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]

Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.

240 mother-infant dyads participated in this study, and all infants were preterm infants weighing less than 1750 g at birth who were current patients in the NICU at one of the four study hospitals. Infants also could not have a congenital neurological issue or be showing symptoms of substance exposure in order to be considered eligible for inclusion in the study. For twins, one infant was randomly selected for inclusion in the study. All mothers with infants meeting eligibility criteria were approached for inclusion in the study, with 249 declining to participate or withdrawing. Therefore, this was a convenience sample that was randomly assigned to groups. 81 dyads were in the control group, 78 dyads were in the ATVV group, and 81 dyads were in the kangaroo care group.

There were differences in the groups of mothers and infants between the hospitals (ex. one of the NC hospitals had smaller and sicker infants); however, there were no infant differences between the intervention and control groups due to the stratified sampling techniques used. The only group difference at baseline between mothers was that the control group had fewer first-time mothers.

The mean gestational age of the sample was 27.2 weeks with an average birthweight of 1012.8 grams. 46.4% of the sample was male, and 17.8% were twins. Infants spent an average of 16.3 days on mechanical ventilation, with 36.3% requiring surgery of some kind; 42.9% had a patent ductus arteriosis, and 15.4% had necrotizing enterocolitis.

Average maternal age was 27.1 years, with 55.5% of mothers being first time mothers and 32.0% of mothers married. Mothers is this sample were predominantly black (68.3%), with 19.2% of the sample being white, 8.3% Hispanic, and 4.2% classified as other.

In total, 194 mother-infant dyads completed the study (N), with drop outs being due to maternal decision to withdraw, infant death, or loss of contact. Individuals who did not complete the study were more likely to be younger and single than those who did complete the study, with higher levels of depressive and anxious symptoms.

Intervention Investigated

[Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

Control

Instead of performing an intervention directly on their infants, mothers received education from the study nurses on safe equipment to help them care for their preterm infants upon discharge home. All meetings took place in the NICU at the infant bedside. Nurses also videotaped these mothers during this time to ensure that they were spending the same amount of time with the study nurses as mothers in the intervention group. Mothers met with study nurses once weekly from enrollment to discharge.

Experimental

ATVV Intervention (Infant Massage):

In this intervention, mothers were taught by study nurses over the course of about one hour how to provide this intervention. They also received written handouts on the intervention and were asked to perform the intervention at least 3 times per week for at least 15 minutes at a time. Interventions were taught and implemented at the infant bedside, and infants were monitored for signs of distress/unstable vitals. Interventions were also always performed before an infant feeding.

The ATVV intervention consists of a 15-minute gradual presentation of auditory, tactile, visual, and vestibular stimuli (in this order) and is a commonly used treatment approach for infant massage. Initially, only the mother's voice (auditory) is presented, with tactile massage being added in, moving from the head/back/chest/abdomen out to the arms and legs. As the infant arouses, eye-to-eye contact (visual) is added in. In the final five minutes, horizontal rocking (vestibular) replaces the tactile component of the intervention.

Mothers were recorded by study nurses when performing the intervention, and corrections were given when necessary. Similar to the control group, these mothers met with study nurses once weekly. After discharge, mothers were asked to continue performing the intervention until their infant reached 2 months corrected age.

Kangaroo Care Intervention:

In this intervention, mothers were taught by study nurses over the course of about one hour how to provide this intervention. They also received written handouts on the intervention and were asked to perform the intervention at least 3 times per week for at least 15 minutes at a time. Interventions were taught and implemented at the infant bedside. Interventions were also always performed before an infant feeding.

With the infant only dressed in a diaper and a hat, the mother was instructed to place the infant directly on her skin in the center of her chest in an upright position. To help regulate the infant's temperature, the side of the infant not directly touching the mother was covered. Mothers were told they could keep the infant on their chest as long as they wanted (but for at least 15 minutes), provided there were no signs of distress or unstable vitals. Additionally, mothers were told they could breastfeed their babies during this time.

Mothers were recorded by study nurses when performing the intervention, and corrections were given when necessary. Similar to the control group, these mothers met with study nurses once weekly. After discharge, mothers were asked to continue performing the intervention until their infant reached 2 months corrected age.

Outcome Measures

[Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

Infant Sleep-Wake Responses

This outcome measure was only scored for infants in the two intervention groups, as there was no interaction with infants in the attentional control group. The predominant arousal state, selected from alertness, drowsiness, active waking, sleep-wake transition, active sleep, and quiet sleep, was scored once a minute for five minutes with both intervention groups by two coders. When there was disagreement, the primary author (Holditch-Davis) also scored the tapes to resolve the dispute. This was done by playing back the videotapes from the intervention sessions. For the ATVV group, the first five minutes after the intervention was performed were used, and for the kangaroo care group, minutes 15-20 were used (even if the infant was still on the mother's chest).

Center for Epidemiological Studies Depression Scale*

This outcome measure is a self-report measure of depression that was completed by mothers at the appropriate time points. There are 20 items that are scored on a 0-3 Likert scale (total score range 0-60), with higher scores indicating increased depressive symptoms.[9]

Information about scoring not provided in the article but pdf of measure found at this link: http://www.chcr.brown.edu/pcoc/cesdscale.pdf

State-Trait Anxiety Inventory (State anxiety subscale)*

This subscale is a self-report measure of anxiety levels at the current moment, which was completed by all mothers participating in this study. This is also a 20-item subscale, with participants rating their agreement with statements using a 1-4 Likert scale (total score range 20-80).[10] Higher scores on this measure are indicative of increased state anxiety (anxiety in the present moment).

Information about scoring not provided in the article but pdf of measure found at this link: https://oml.eular.org/sysModules/obxOML/docs/id_150/State-Trait-Anxiety-Inventory.pdf

Perinatal PTSD Questionnaire

This outcome measure assesses a mother's levels of PTSD related to childbirth and the perinatal experience, as measured by self-report of the mother. This article did not provide specific details about the scoring of this measure.

Parental Stress Scale: Prematurely Born Child*

This outcome measure is an adaptation of the parental stress scale that is specifically modified to include items pertinent to parents of premature infants. It is also a self-report measure that was completed by the mother. This article also did not provide any specific information about the scoring of this item.

Neonatal Behavioral Assessment Scale

This measure consists of 6 items that are used to measure infant responsiveness, including both animate and inanimate responsiveness. All items are scored using a 1 to 9 scale, with a higher score indicating increased responsiveness (total score ranging from 9 to 54). A member of the assessment team completed this measure at the infant bedside prior to discharge.

Worry Index

The worry index is a self-report scale completed by mothers assessing their levels of concern related to their infant and the infant's potential risk for the development of health issues in the future. All items are rated on a 5-point scale. However, information regarding the total number of items was not provided.

Vulnerable Child Scale

This measure is an additional assessment of the mother's concern related to her child's risk of developing health problems in the future that can be completed for toddlers (so only used at the 12 month follow up). Mothers completed this self-report measure of 16 items that are all rated on a 4-point Likert scale, with total scores ranging from 16 to 64. Lower scores on this measure correlate to increased levels of concern and heightened perceived child vulnerability.

Mother-infant videotapes

These videotapes consisted of a 45-minute interaction in the home between the mother and her infant and was taken while the infant was awake and included a feeding. Later on, videos were coded with maternal and child behaviors being recorded every 10 seconds. All items were scored as a percentage of time they were present out of the duration of the video. Items included child activity levels (asleep to very active) and time the infant was interacting with the mother vs. playing with toys. Additionally, mother touch, mother interaction, mother talk, mother involvement with the child, positive affect of the mother, teaching by the mother, maternal touch, mother playing with the child, positive affect of the child, negative affect of the child, child independent play with objects, child locomotion, gesturing by the child, and vocalization by the child were all coded for as well by assessor blinded to group assignment.

HOME Inventory

The HOME inventory is a measure that assesses the social-emotional home environment, with all 45 items being scored as present or not present. These items were also scored by members of the assessment team who were blinded to group assignment using the 45 minute videos described above. However, only 8 items on the HOME inventory were able to be analyzed using these videotapes.

All self-report measures were administered by a member of the assessment team and completed by the mother.

Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. You may summarize results in a table but you must explain the results with some narrative.]

Infant predominant sleep-wake state

Infants in **the ATVV intervention were found to spend significantly more time post-intervention in alert, total awake, and total alert (all $p < .001$) states** than infants in the kangaroo care group. They were also found to spend significantly less time in active sleep ($p < .01$), quiet sleep ($p < .05$), and total sleep ($p < .001$) states than the kangaroo care group.

Maternal psychological distress

Specific scores on the measures of maternal psychological distress were not provided. However, **across all three groups, all four variables of psychological distress significantly declined over time ($p < .01$).** Additionally, **mothers performing infant massage had a significantly quicker decline in depressive symptoms ($p < .05$)** than mothers who performed kangaroo care or no intervention. Additionally, **parenting stress was lower for parents who completed infant massage ($p < .001$) and parents who completed kangaroo care ($p < .01$) than parents who did not complete either intervention**.

Infant responsiveness

Infants in the control group had the highest average score on orientation items on the Neonatal Behavioral Assessment Scale, with infants in the ATVV intervention group having the next highest average score and infants in the kangaroo care group having the lowest average score. However, these **differences were not significant between groups**. Additionally, when comparing average scores on the inanimate and animate orientation subscales (control group and ATVV group having the highest scores, respectively), there were no group differences.

	Control	ATVV	Kangaroo Care
	Mean (SD)	Mean (SD)	Mean (SD)
Inanimate Orientation	4.46 (1.63)	4.34 (1.65)	4.02 (1.42)
Animate Orientation	5.05 (1.40)	5.06 (1.56)	4.68 (1.40)

Total Orientation	4.76 (1.42)	4.71 (1.50)	4.37 (1.32)

Maternal perceptions of the infant

Similar to maternal psychological distress, maternal concern about their infant's health status declined over time for all three groups, although no specific scores on these outcome measures were provided. **Mothers in the kangaroo care group, however, had a significantly faster decline in worry about their infants than mothers in the ATVV intervention or control group ($p < .05$).**

Mother-infant interaction

Across all three groups, **positive involvement of the mother increased with age, but there was no significant difference between groups** (no scores provided in the article). However, they did find that **infants in the kangaroo care group had a significantly higher level of social behaviors than infants in the ATVV intervention group ($p < .01$)**; neither group differed significantly from the control group.

Social-emotional aspects of home environment

Mothers who completed massage had higher scores on the HOME scale (specific scores not provided) than mothers who did not complete either intervention ($p < .05$). Mothers who completed kangaroo care also had higher scores on the HOME scale than mothers who did not complete either intervention, but this difference was not significant ($p < .07$).

Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

Authors concluded that ATVV promoted more awake/alert states in infants, while kangaroo care promoted more sleep states, which they expected. Additionally, they found that ATVV was correlated with a faster decline in depressive symptoms, kangaroo care was associated with a faster decline in worry about the infant's health status, and that performing either intervention was related to decreased parenting stress. Additionally, they found an improved social-emotional home environment when engaging in either intervention (particularly ATVV) as compared to the control group. Additionally, they found that infants who received kangaroo care had increased levels of social behaivors when compared to individuals who received ATVV.

These authors concluded that ATVV and kangaroo care positively impacted mothers and mother-infant dynamics and that "although the long-term effects are not as great as previously reported, the positive short-term outcomes support the continued use of these two interventions." (p. 13)

Critical Appraisal

Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

Overall, this study had a low-moderate risk of bias as measured by the PEDro scale, with a score of 6/10. The main risk of bias was with respect to blinding, as the subjects, therapists, and assessors all could not be blinded, which is often the case in this type of research and was where the study lost most points on the PEDro scale. However, researchers took lengths to blind as much as possible, with all assessors other than the mothers completing self-report measures blinded to intervention group. The other area where this study lost a point was because 21% of the sample withdrew with no outcome measures recorded. As noted by the study researchers, there were differences among those who completed the study and those who did not, which could have confounded results as it was not fully representative of the population of preterm infant-mother dyads. However, this study had many strengths as well. They had random and concealed allocation to groups, and, as mentioned above, assessors were blinded wherever possible. They also had multiple coders score each video to help ensure reliability of scoring and used the same coders for all videos. All study nurses received the exact same training in the treatment protocols to help ensure uniformity with the interventions. Additionally, groups did not differ at baseline, and all individuals received the allocated intervention (or control). However, mothers were not restricted from performing any other interventions with their infants when they visited (58% of mothers in the control group did some form of massage or kangaroo care with their infants), which lowers the internal validity of the study. Additionally, the analyses were thorough, with between group differences reported for all outcomes and point measures and measures of variability provided for some. Researchers also noted that only around 60% of mothers completed their visit diary, where they logged which intervention they performed with their infant, which also lowers the internal validity. With respect to the interventions, mothers in the kangaroo care group were told they could perform their intervention for longer than 15 minutes, while mothers in the ATVV group were given a 15-minute intervention; this also decreases internal validity as the time of intervention could play a role in any group differences noted. Another strength of this study was recruitment from different hospitals in different states and geographic areas (ex. urban vs. suburban) with mothers from different socioeconomic backgrounds and

children with varying illness levels, which helped create a diverse sample representative of all preterm infants and their mothers, which lead to strong external validity of the study.

Interpretation of Results

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

This study shows that there may be some maternal psychological benefit to performing either ATVV or kangaroo care, in addition to an improved mother-infant relationship as measured by the social-emotional aspect of the home environment. This study found that ATVV interventions may have a greater benefit in improving depressive symptoms as compared to kangaroo care, while kangaroo care may have a greater benefit in decreasing parental worry about their infant. Both interventions help decrease levels of parenting stress as measured by self-report; this effect seemed to be slightly larger for mothers completing the ATVV intervention ($p < .001$ vs. $p < .01$), but this would require further analysis to see if this is a clinically significant difference. Therefore, it is difficult to say that one intervention is superior to the other, but this study clearly demonstrates that both interventions (performed alone) do provide clinical benefit for the mother and mother-infant relationship compared to performing no intervention at all. It would also be possible for mothers to engage in both interventions, which could potentially only enhance benefits (since both interventions improved different maternal psychological variables), but this would require further research to determine.

Applicability of Study Results

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

This study was very relevant to the clinical question. It was a sample of preterm, hospitalized infants and their mothers, which fits the clinical question and was also a direct comparison of infant massage using a commonly-utilized protocol (ATVV) and kangaroo care. However, it did not measure stress levels via salivary cortisol; however, none of the articles that fit the inclusion and exclusion criteria used salivary cortisol. Therefore, this article fit the clinical question as well as possible given the existing literature. Additionally, this appeared to be a feasible intervention to teach parents (ATVV) as it only takes 15 minutes to complete, and mothers saw benefits with performing this intervention only 3 times per week.

(2) Description and appraisal of (Parental Engagement and Early Interactions with Preterm Infants Reduce Risk of Late Postpartum Depression) by (Xie et al., 2019)

Aim/Objective of the Study/Systematic Review:

The purpose of this study was to evaluate the impact of a parental engagement program (includes infant massage) on maternal psychological wellbeing and the mother-infant relationship for mothers of preterm infants in comparison to the current standard care (includes kangaroo care).

Study Design

[e.g., systematic review, cohort, randomised controlled trial, qualitative study, grounded theory. Includes information about study characteristics such as blinding and allocation concealment. When were outcomes measured, if relevant]

Note: For systematic review, use headings 'search strategy', 'selection criteria', 'methods' etc. For qualitative studies, identify data collection/analyses methods.

This was a randomized controlled trial of mothers and their preterm, hospitalized infants, with 162 mother-infant dyads enrolling for participation in this study. Dyads were randomly assigned to either an early parent interaction program or standard care (control), although there was no mention of allocation concealment.

There was no blinding of study participants or therapists teaching the interventions, as they were physically involved in providing the interventions. However, all videoing of mother-parent interactions and scoring of those videos were performed by individuals who were blinded to group assignment. Additionally, all assessors collecting neonatal variables/assessing infant development and maternal competencies (maternal adjustment variables) were blinded to group assignment.

Mother-infant dyads were followed from the time of enrollment until the infants reached a corrected age of 12 months. The intervention was provided until discharge, although it is possible mothers continued the intervention techniques post-discharge. Outcomes were either collected at the time of enrollment, discharge, and/or the 12-month corrected age follow-up:

	Enrollment	**Discharge**	**12 Months Corrected Age**
Demographics	**X**	**X**	
Neonatal Variables/Infant Development	**X**	**X**	**X**
Knowledge of Child Development		**X**	**X**
Maternal Adjustment (Coping)		**X**	
Maternal Adjustment (Depression)		**X**	**X**
Maternal Adjustment (Parenting Stress)			**X**
Mother-Infant Interaction			**X**

Researchers used PASW statistics to complete all analyses, and the level of significance was set at $p < .05$.*T*-tests and Pearson's chi-squared tests were used for all analyses for continuous and categorical data, respectively.

Setting

[e.g., locations such as hospital, community; rural; metropolitan; country]

This study took place in the Neonatal Intensive Care Unit at the Wuxi Children's Hospital, with a 12-month follow up appointment taking place outside of the hospital (location not disclosed).

Participants

[N, diagnosis, eligibility criteria, how recruited, type of sample (e.g., purposive, random), key demographics such as mean age, gender, duration of illness/disease, and if groups in an RCT were comparable at baseline on key demographic variables; number of dropouts if relevant, number available for follow-up]

Note: This is not a list of the inclusion and exclusion criteria. This is a description of the actual sample that participated in the study. You can find this descriptive information in the text and tables in the article.

162 mother-infant dyads enrolled in this study. Infants were considered eligible if they were a singleton birth, had a gestational age between 28 and 34 weeks at birth, and had an APGAR score of at least 4 at either 1 or 5 minutes post-birth. All infants meeting these eligibility criteria that were born at the Wuxi Children's Hospital in either 2015 or 2016 were invited to participate in the study. Of the 151 mother-infant dyads who completed this study (N), 79 were in the Early Parental Interaction intervention group and 72 were in the standard care group. Of the 11 dyads who did not complete the study, 6 were removed due to medical complications (infants had to be free from nervous system disorders, intraventricular hemorrhage, seizures, congenital anomalies, and intrauterine illicit drug exposure), and 5 did not complete the 12-month follow up.

Mothers in the two groups did not differ on any of the key demographic information collected (age, marriage status, college education), with all *p*-values >/= .121. Infants in the two groups did not significantly differ on gestational age, birth weight, or infant sex, with all *p*-values >/= .198.

The average age of mothers in this sample was 31.4 years, and 81.5% of mothers were married. Additionally, 18.5% of mothers included in this sample had a college education.

The average gestational age of infants included in this study was 30.96 weeks, with an average birth weight of 1751.9 grams. While this weight is low, researchers noted that all infant birth weights were considered appropriate for their gestational age. This sample of infants was predominantly male (86.1%). On average,

infants spent 1.7 days on mechanical ventilation and 3.0 days on supplemental oxygen. 55 infants (36.4%) had respiratory distress that required mechanical ventilation, and 8 (5.3%) had apnea that required mechanical ventilation. No infants required surgery or had necrotizing enterocolitis.

Intervention Investigated

[Provide details of methods, who provided treatment, when and where, how many hours of treatment provided]

Control

Standard Care:

Infants in the control group received the current standard of care in the NICU from nurses and other medical staff. In this hospital, this included kangaroo care, which is an intervention in which the infant is placed directly on the mother's chest, promoting skin to skin contact between the mother-infant dyad. Kangaroo care was started after the infants were no longer on mechanical ventilation. Additionally, it included nesting and minimal handling. All care took place in the NICU at the infant bedside.

Experimental

Early Parent Interaction:

Infants in this group received the standard care described above, in addition to their intervention. The intervention consisted of 9 educational sessions covering how to care for a preterm infant (8 during hospital admission and 1 post-discharge) based on the PremieStart protocol, with education provided by a NICU nurse. Additionally, mothers were trained by study nurses in how to perform infant massage, which included a visual component when the infants were alert. Mothers performed infant massage on their infants at the infant bedside twice daily once the infant reached 30 weeks postmenstrual age and continued this throughout the duration of their hospital admission, although it was not specified how long each massage session was. Any interactions between the mother and infant were logged every day.

Outcome Measures

[Give details of each measure, maximum possible score and range for each measure, administered by whom, where]

Specific information about each outcome measure (beyond the name, what the measure assesses, who performed) was not provided in the article, so information sources included when links to the outcome measure were freely available.

Neurobehavioral Assessment of the Preterm Infant

This is an assessment of infant development that can be used with preterm infants who may not yet have reached full term age. Items included on this measure assess scarf sign, motor development and vigor, popliteal angle, alertness and orientation, irritability, cry quality, and percent asleep ratings. It was completed by study nurses who were blinded to group assignment while the infant was still in the hospital. Information about scoring was not provided in this article.

Griffiths Mental Development Scales

This is another assessment of infant or toddler development across multiple domains (locomotor, personal-social, hearing and language, eye-hand coordination, performance). It was completed by an assessor who was blinded to infant group assignment at the 12-month follow up appointment. Specific information about scoring was not provided in the article.

Bayley Behavior Rating Scale

This measure is a subsection of the Bayley Scales of Infant Development that assesses an infant or toddler's behavioral status on the following scales: orientation/engagement, emotional regulation, and motor quality. At the 12-month appointment, a study assessor who was blinded to group assignment completed this assessment of the child. Information about scoring was not provided in the article.

Knowledge of Infant Development Inventory

This is a measure that can be used to assess a parent's knowledge of typical infant development. A study assessor blinded to group assignment performed this measure with parents at both discharge and the 12 month follow up appointment. Specific information about scoring was not provided in the article.

Catalog of Previous Experience with Infants

This measure can be used to determine an individual's previous levels of experience with infants in babysitting, professional life, media influences, and social comparison processes. At discharge, a study assessor completed this measure with mothers in the hospital. There was no information about the scoring of this measure that was provided in the article.

Ways of Coping Questionnaire

This is a measure that assesses an individual's methods of coping across multiple dimensions (confrontive coping, distancing, self-controlling, seeking social support, accepting responsibility, escape-avoidance, planful problem-solving, and positive reappraisal). This measure was completed at discharge by a study nurse who was blinded to group assignment. However, there was no specific information about scoring provided in the article.

Edinburgh Postnatal Depression Scale

This measure can be used to assess postnatal depression in mothers. It is a 10-item assessment with each item scored on a 0-3 Likert scale (total scores ranging from 0-30), with a score of 10 being considered at risk for postnatal depression.[11] This measure was completed at discharge and the 12-month follow up by a study assessor who was blinded to group assignment.

Information about scoring not provided in the article but pdf of measure found at this link: https://www.fresno.ucsf.edu/pediatrics/downloads/edinburghscale.pdf

Parenting Stress Index

This measure can be used to assess levels of stress specifically related to parenting and was completed at the 12-month follow up appointment by a study assessor who was blinded to group assignment. Information related to scoring of this measure was not provided in the article.

Monash Mother-Infant Interaction Scale

This measure is an assessment of the relationship and interactions between a mother and her infant. It was scored by an assessor who was blinded to group assignment by watching a 10-minute video of a mother and her child playing together that was collected at the 12-month follow up appointment. Specific information regarding scoring was not provided in this article.

Dyadic Mutuality Code

The dyadic mutuality code is another assessment of the interactions between a mother and her infant that looks more specifically at responsivity. It was also scored based on the 10-minute video collected at the 12-month follow up appointment by an assessor who was blinded to group assignment. Information about scoring of this measure was not provided in the article.

Mother-Infant/Toddler Play Scale

This is another measure assessing the relationship between mothers and infants, specifically looking at how they interact during play across multiple dimensions: dyadic reciprocity, maternal responsiveness, dyadic conflict, and maternal intrusiveness. This was scored based on the 10-minute video from the 12-month follow up appointment and was also scored by an assessor blinded to group assignment. There was no information regarding the scoring of this measure in the article.

Main Findings

[Provide summary of mean scores/mean differences/treatment effect, 95% confidence intervals and p-values etc., where provided; you may calculate your own values if necessary/applicable. Use a table to summarize results if possible.]

Infant Development

There were **no significant group differences on any of the subscales** (scarf sign, motor development and vigor, popliteal angle, alertness and orientation, irritability, cry quality, percent asleep ratings) **of the Neurobehavioral Assessment of the Preterm Infant at discharge** (*p*'s ranging from 0.199 to 0.416). The average scores for both groups also fell within the expected reference range for the infant's age at the time of assessment.

Additionally, there were **no group differences on any of the subscales of the Griffiths Mental Development Scales** (locomotor, personal-social, hearing and language, eye-hand coordination, performance) **at the 12 month follow up**, with *p*-values ranging from .091 to .377. The group difference on the personal-social scale approached significance ($p = .091$), with the Early Parent Interaction Group having a higher score. The Early Parent Interaction Group also had a slightly higher average score on the general quotient (94.5 +/- 9.1) as compared to the Standard Care group (93.9 +/- 9.8), although this difference was also not significant ($p = .160$). All average scores for both groups also fell within the reference range for infants of this age.

There were also **no significant group differences on any subscale of the Bayley Behavior Rating Scale** (orientation/engagement, emotional regulation, motor quality) **at the 12-month follow up** (*p*-values

ranging from .114 to .303). The Standard Care group had a slightly higher total score (57.3 +/- 25.5) compared to the Early Parent Interaction group (55.7 +/- 24.8), although this difference was not significant (p = .105). These scores also fell within the expected reference range for these infants.

Knowledge of Child Development

At discharge, there were **no significant group differences on either the Knowledge of Infant Development Inventory or the Catalog of Previous Experience with Infants**, although the Standard Care group tended to have higher average scores.

Knowledge of Infant Development Inventory

	Early Parent Interaction	**Standard Care**	***p*-value**
Mean Total Scores	74.4 +/- 14.3	75.1 +/- 15.9	.258

Catalog of Previous Experience with Infants

	Early Parent Interaction	**Standard Care**	***p*-value**
Early babysitting experiences	4.4 +/- 2.5	4.7 +/- 2.9	.297
Professional experiences	1.2 +/- 1.9	1.8 +/- 2.4	.175
Media influences	2.5 +/- 1.4	2.9 +/- 1.8	.166
Social comparison processes	5.8 +/- 2.4	6.9 +/- 1.7	.107

Maternal Adjustment (Coping)

Additionally, there were **no significant group differences on any of the subscales of the Ways of Coping Questionnaire at discharge** (p-values ranging from .133 to .614).

Ways of Coping Questionnaire

	Early Parent Interaction	**Standard Care**	***p*-value**
Confrontive coping scale	0.7 +/- 0.3	0.7 +/- 0.4	.511
Distancing scale	0.6 +/- 0.5	0.5 +/- 0.5	.133
Self-controlling scale	0.6 +/- 0.4	0.7 +/- 0.5	.175
Seeking social support scale	1.7 +/- 0.8	1.6 +/- 0.9	.201
Accepting responsibility scale	0.3 +/- 0.5	0.3 +/- 0.6	.614
Escape-avoidance scale	0.7 +/- 0.5	0.6 +/- 0.7	.139
Planful problem-solving scale	1.1 +/- 0.6	1.2 +/- 0.9	.174
Positive reappraisal scale	1.3 +/- 0.7	1.3 +/- 0.6	.528

Maternal Adjustment (Depression)

At **discharge, there were no significant group differences in the average score on the Edinburgh Postnatal Depression Scale or in the percentage of mothers at risk for depression** (score greater than or equal to 12), with *p*-values of .260 and .153, respectively.

At the **12 month follow up, the Early Parent Intervention group had lower scores, although this only approached significance** ($p = .075$). However, the **Early Parent Intervention group also had significantly fewer mothers deemed at risk of postnatal depression** than the Standard Care group ($p = .024$).

Edinburgh Postnatal Depression Scale

	Early Parent Intervention	**Standard Care**	***p*-value**
Discharge			
Total Score	5.7 +/- 3.5	5.9 +/- 3.9	.260
Score >/= 12	11.4%	12.5%	.153
12-month follow up			
Total Score	5.8 +/- 3.5	6.6 +/- 4.9	.075
Score >/= 12	10.1%	16.7%	**.024**

Maternal Adjustment (Parenting Stress)

There were also **no significant group differences in levels of parenting stress at the 12 month follow up** ($p = .449$).

Parenting Stress Index

	Early Parent Intervention	**Standard Care**	***p*-value**
Mean Total Scores	123.4 +/- 28.3	126.4 +/- 30.3	.205

Mother-Infant Interaction

At the **12 month follow up, there were no significant group differences on any of the measures of mother-infant interaction** (Monash Mother-Infant Interaction Scale, Dyadic Mutuality Code, and Mother-Infant/Toddler Play Scale), with *p*-values ranging from .227 to .668. On the Dyadic Mutuality Code, mothers were found to have scores similar to mothers of healthy preterm infants. On both other scales, mothers were found to have scores in the typical reference range.

Original Authors' Conclusions

[Paraphrase as required. If providing a direct quote, add page number]

These authors concluded that the Early Parent Intervention program, which included infant massage, did not lead to any increased benefits for the infant in terms of neurodevelopment as compared to a Standard Care group. However, they did note that all scores for infants in this study fell in the reference range on neurodevelopmental measures, which could be due to their exclusion of infants with many medical conditions, so it is possible there are benefits that were not found for infants who are more medically complex. Additionally, they did not find any benefits in terms of an improved mother-infant relationship, maternal stress, or maternal coping after completing infant massage. However, they did find that there is a long-term psychological benefit for mothers after participating in this Early Parent Intervention, with fewer mothers in this group being considered at risk for postnatal depression. This difference was only present after a 12-month follow up and not upon completion of the intervention (discharge). They concluded that an early parent intervention that includes infant massage should be utilized in the care of preterm infants to help improve maternal outcomes.

Critical Appraisal

Validity

[Summarize the internal and external validity of the study. Highlight key strengths and weaknesses. Comment on the overall evidence quality provided by this study.]

This article had a low risk of bias, with overall strong levels of internal validity. The main threat was the lack of blinding of both subjects and therapists administering the intervention, which was not possible due to the nature of the interventions. However, researchers did make efforts to ensure blinding of all individuals collecting scores for outcome measures. Participants were all randomly assigned to groups; however, it was not stated if allocation was concealed so this could not be assumed. There were no group differences at baseline, which helps attribute differences found to the interventions themselves. There was a very low dropout rate of this study (6.8%), which also strengthens the internal validity of the study. Further, all subjects who were included in the final analyses received the intervention they were randomly assigned to. There was also extensive reporting of data, with means and standard deviations reported for all measures and between group comparisons provided for all outcome measures. However, the sample of infants was overwhelmingly male, which makes it a little more difficult to generalize to the overall population of preterm infants. Additionally, these were preterm infants who did not have any major medical conditions, which could also make it more difficult to generalize. More demographic information about the mothers could have helped determine how representative of a sample it was of mothers to determine generalizability to all mothers. The lack of information related to the interventions was another weakness of the study; the article did not discuss specifics of infant massage (ex. areas massaged, length of time massage performed) or the topics covered during the educational sessions, which makes it difficult to attempt to replicate this study.

Interpretation of Results

[This is YOUR interpretation of the results taking into consideration the strengths and limitations as you discussed above. Please comment on clinical significance of effect size / study findings. Describe in your own words what the results mean.]

This article demonstrates that interventions promoting early parent interaction for preterm infants in the neonatal intensive care unit do not necessarily promote improved development in these infants at one year when compared to standard care. However, considering that all infants scored in the normative range on neurodevelopmental assessments and that the infants included in this study were relatively healthy preterm infants, it is more difficult to ascertain if these interventions would actually help improve outcomes for infants who were experiencing neurodevelopmental delay. This article did not demonstrate a reduction in stress for parents of preterm infants who completed the intervention compared to parents who did not complete the intervention; however, this was only assessed at a 12-month follow up, so it cannot be determined whether or not infant massage helps reduce levels of stress in the more immediate aftermath when parents may be experiencing heightened stress from their infant's hospitalization. This article did find that infant massage could improve some maternal psychological outcomes, specifically a reduced risk of postnatal depression at the 12-month follow up. Unfortunately, no effect sizes were reported for this difference, which makes it difficult to determine the clinical significance. This article also did not find any differences in maternal-infant attachment based on the intervention, so this intervention may not lead to any improvements here. However, similar to infant neurodevelopment, all scores were in the normative range, so it is possible that there could be differences in a more medically complex clinical sample that were missed in this population. Therefore, this article indicates that there could be some long-term maternal psychological benefit to performing additional interventions, including infant massage, while infants are still in the NICU.

Applicability of Study Results

[Describe the relevance and applicability of the study to your clinical question and scenario. Consider the practicality and feasibility of the intervention in your discussion of the evidence applicability.]

Overall, this article was also moderately-highly relevant to the clinical question. It was looking specifically at a sample of mothers of hospitalized preterm infants, which was the intended population in the clinical question. Additionally, it directly compared the two interventions (kangaroo care and infant massage). However, both groups received kangaroo care, so this looked more at the impact of the addition of infant massage rather than one intervention versus the other. Additionally, the infant massage intervention also included educational components that were not provided to the other group, so it is difficult to say if differences found were directly a result of the infant massage provided. Lastly, the stress levels of the mothers were assessed by a question-based outcome measure, rather than salivary cortisol which was the focus of the clinical question. As noted previously, however, there were no existing articles investigating salivary cortisol changes as a result of infant massage, so this article provided the best existing assessment changes in stress levels after infant massage. Asking parents to perform infant massage twice daily may be difficult to feasibly achieve (and this article did not comment on maternal compliance with the intervention), but due to the low risk or cost of implementing this intervention, it seems feasible to encourage parents to perform infant massage as often as possible when they are visiting their infants in the NICU.

SYNTHESIS AND CLINICAL IMPLICATIONS

[Synthesize the results, quality/validity, and applicability of the two studies reviewed for the CAT. Future implications for research should be addressed briefly. Limit: 1 page.]

After reviewing the literature, there does not appear improved infant outcomes as a result of performing infant massage or kangaroo care.[3,5] Additionally, Holditch-Davis et al. did not find any differences related to infant responsiveness, and both Holditch-Davis et al. and Xie et al. did not find any differences in mother-infant interactions for dyads who completed infant massage, kangaroo care, or neither.[3,5] Infant massage did seem to lead to an improved social-emotional home environment as compared to performing no intervention (not significantly improved compared to performing kangaroo care).[3]

It appears that there is some maternal psychological benefit to be gained from implementing infant massage protocols in the NICU. However, current research does have discrepancies related to what that benefit might be. Both articles indicated that infant massage improves outcomes related to depressive symptoms.[3,5] Holditch-Davis et al. found that there was a more rapid decline in depressive symptoms for mothers completing infant massage as compared to those completing kangaroo care, while Xie et al. found a decreased risk for the late development (but not early development) of postnatal depression for mothers completing infant massage and kangaroo care compared to those who only completed kangaroo care.[3,5] Holditch-Davis et al. found that kangaroo care led to a faster decline in worry about their infant's health than those who did performed infant massage.[3,5] However, there appeared to be no difference in levels of anxiety, perinatal PTSD, or coping among mothers who performed infant massage and those who did not.[3,5]

With respect to the clinical question, Holditch-Davis et al. found that performing either infant massage or kangaroo care leads to decreased levels of stress compared to performing no intervention (no difference compared to each other), while Xie et al. found that the addition of infant massage to a protocol including kangaroo care did not lead to any additional decline in parental stress.[3,5] Therefore, it does not appear that infant massage is more effective than kangaroo care at reducing levels of stress in parents as measured by self-report measures, although both appear to improve stress levels in mothers of preterm infants. It is also important to note that the Xie et al. intervention also included parent education sessions that were not provided to the control group, so any differences found could possibly be attributed to that.[5]

However, due to the low cost and general feasibility of implementing these interventions, both should still be considered for use with preterm infants. As mentioned above, kangaroo care becomes less popular among parents as infants grow, so infant massage could be used more as parents have less desire to engage in kangaroo care (or in addition to kangaroo care where parents are willing to perform both). The other maternal psychological benefits that have been found as a result of infant massage provide further support for its clinical use.

Overall, the quality of existing literature related to this topic is low. Many studies have a lower quality design (quasi-experimental or qualitative reviews of the literature). Additionally, many of the existing studies have a poor methodological design, with small sample sizes and thus poor statistical power, ability for participants to choose their intervention group, significant differences in groups at baseline, or a lack of detail in the write up regarding study design. Additionally, there are very few studies that directly compare infant massage and kangaroo care (many often compare one to a control or have these interventions grouped with other interventions). Additionally, there is less existing research on infant massage as compared to kangaroo care.

However, the two articles appraised in this CAT are of a high quality with overall strong levels of validity; the main threat to internal validity in both studies was the lack of blinding of participants and study nurses. However, due to the nature of the interventions, it is not possible to create protocols where these individuals are blinded. Another issue is the relative scarcity of research that has investigated this topic. However, as discussed above, future research should focus on increasing the representativeness of the sample to improve external validity, especially considering the use of infant massage with sicker infants who may have more medical complications, and thus, parents with even more greatly increased stress levels.

Additionally, in the future, research should focus on using salivary cortisol to assess potential changes in stress as this provides a more objective measure of stress levels. Self-report measures are open to an individual interpretation, so using salivary cortisol would help strengthen any conclusions related to changes in parental stress levels as a result of this intervention.

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