FOCUSED QUESTION
For premature infants, does varying post-natal lying positions compared to standard prone position prevent neuromuscular and psychomotor abnormalities?


CLINICAL BOTTOM LINE:

When preterm infants are placed lying prone or supine, they will naturally lie with all four limbs flattened against the mattress as a result of gravity. This position may cause hip deformities. Lying supine in this position puts preterm infants at risk of falling into the “frog legged” position. Possible neuromuscular deviations shown in preterm infants lying in frog-leg position include tendency to retract arms, demonstrated difficulty in axel rotation of the neck, and increased hyperextension of the neck. Regularly changing infant positions from prone, supine, and side, could eliminate these postural deviations. This study provides a high level of evidence that indicates changing preterm infants positions to prone, supine and side lying every 3 to 4 hours while in the neonatal intensive care unit (NICU) can have a positive effect on the infant’s neuromuscular and psychomotor development at time of discharge. Specifically, sensory motor improvements were noted with changing positions.

Clinical and community-based practice of OT: This information is clinically relevant for occupational therapists working with preterm infants who are in a NICU. It indicates the importance of a positioning protocol on an infant’s neuromuscular and psychomotor development.

Education and Training: Occupational therapists and any other medical personnel working in the NICU should have some training on how to properly position infants in all the different positions (supine, prone, side). Occupational therapy practitioners working with this population can educate and train other medical personnel working in the NICU on the benefits of changing the infant’s positions.

Program development: Occupational therapy program developers will be able to use this research as a basis for a positioning protocol for preterm NICU infants. They will also be able to oversee and follow the infant’s neuromuscular and psychomotor status while in the NICU.
**Research:** Continued research needs to be conducted on the long term effects of positioning. Studies thus far focus on the short-term effects of positioning while the infants are in the NICU, and not with long-term effects of positioning on developmental milestones.

**RESEARCH OBJECTIVE(S)**

List study objectives.

To investigate the short-term effects of varied postnatal lying positions on premature infants and evaluate their effect in preventing neuromuscular and postural abnormalities.

**DESIGN TYPE AND LEVEL OF EVIDENCE:**

Level 1: Randomized control trial

Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *Circle yes or no, and if no, explain.*

YES/NO

**SAMPLE SELECTION**

How were subjects selected to participate? Please describe.

This was a convenient sample. All infants were born at Baudelocque Maternity Ward and admitted directly into the neonatal unit.

**Inclusion Criteria**

*Low-risk preterm infants* are defined as infants born 31–36 weeks’ gestational age without congenital or genetic neurological abnormalities and having a normal cranial ultrasound.

**Exclusion Criteria**

Infants who had initially received treatment in an intensive care unit, and infant from a multiple birth (triplets or above), an infant from a breach delivery, infants with deformities of prenatal origin (fractures, subluxation), genetic abnormalities, hereditary diseases, neurological abnormalities detected within the first week of life, infants who received mechanical ventilation, refusal from the parents to continue the study, or referral of the infant to another department during convalescence.

**SAMPLE CHARACTERISTICS**

*N = 60*

<table>
<thead>
<tr>
<th>% Dropouts</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>#/ (%) Male</td>
<td>30/ (50%)</td>
</tr>
<tr>
<td>#/ (%) Female</td>
<td>30/ (50%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>NR</td>
</tr>
</tbody>
</table>
Disease/disability diagnosis: Infants born at 31–36 weeks’ gestational age (31–33 weeks n = 21; 34–36 weeks n = 39)

Check appropriate group:

<table>
<thead>
<tr>
<th>Group</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20/study group</td>
<td></td>
</tr>
<tr>
<td>20–50/study group</td>
<td></td>
</tr>
<tr>
<td>51–100/study group</td>
<td>✓</td>
</tr>
<tr>
<td>101–149/study group</td>
<td></td>
</tr>
<tr>
<td>150–200/study group</td>
<td></td>
</tr>
</tbody>
</table>

**INTERVENTION(S) AND CONTROL GROUPS**

*Add groups if necessary*

**Group 1: Treatment**

| Brief Description | Infants were placed on a special moldable mattress (BONDUS moldable mattress) while lying on their sides and backs only. The mattress was able to support the infant in lateral decubitus by molding around the rear of the body to support the head in line with trunk. When lying on their back, the mattress would shape to hold the shoulders back while keeping the knees bent forward. The infants did not require the special bolster; only the hospital supplied bolster used and placed under the hips as with all admitted preterm infants while lying prone. Change of the position was reported by the nurse on call for each infant and posted on the planning chart for each infant. The nurses were instructed to vary the positions equally. |
| Setting | Infants who were born at the Badudelocque Maternity Ward and admitted directly into the NICU. For all examinations, the infants were brought and placed on special examinations tables by nurses. |
| Who Delivered? | Nursing staff. |
| Frequency? | Repositioned every 3 to 4 hours corresponding with mealtimes. |
| Duration? | Infants in this group were assessed when they were discharged after convalescence, with a mean period of 38 weeks’ gestational age. |

**Group 2: Control**

| Brief Description | Infants were positioned prone accordingly to the usual practice and care that was performed in the NICU. All infants in this group were positioned in a preventative orthopedic position of the pelvis and legs by using a hand-rolled sheet used to form a small bolster. This was used to prevent frog-legged position. The same hand-rolled sheet was used to raise the pelvis without flexing the hips more than 90˚ to make sure that the infant was not experiencing external rotation or adduction of the legs. |
| Setting | Infants who were born at the Badudelocque Maternity Ward and admitted directly into the NICU. For all examinations, the infants were brought and placed on special examinations tables by nurses. |
| Who Delivered? | Nursing staff. |
| Frequency? | NR |
| Duration? | Infants in this group were assessed when they were discharged after convalescence, with a mean period of 38.4 weeks’ gestational age. |
**Intervention Biases:** *Circle yes or no and explain, if needed.*

| Contamination | YES/NO | Contamination did not occur, because the article did not state that a member of the control group received the different positioning techniques every 3 to 4 hours that the treatment group received. |
| Co-intervention | YES/NO | The article did not mention co-intervention, as there was not any mention of the infants receiving other interventions at the same time as the study treatment. |
| Timing | YES/NO | In the treatment group, infants were repositioned every 3 to 4 hours, and this information was logged by being posted on the planning chart for each infant. Since the intervention was done within the first few weeks of life, maturation could be a factor in the improvements seen. This inevitably would have favored the control group, but this was not seen in the results of the study. |
| Site | YES/NO | All infants were born in the same hospital. This could have introduced bias if the hospital trends to serve one population over another, is private vs. a public hospital, or is receiving different funding support. |
| Use of different therapists to provide intervention | YES/NO | It was not stated whether different groups of nurses cared for the different infant groups. It also did state whether the nurses were blind to the infant’s group assessment. Because the nurses were in charge of recording the positioning of the infants on the planning chart for each infant, it could be assumed they were aware of which infants were in each group assignment. |

**MEASURES AND OUTCOMES**

Complete for each relevant measure when answering the evidence-based question:

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article–yes/no/NR [not reported]), and how frequently the measure was used.

**Neurological assessment:** Collection of muscle tonus and primitive examinations used to specifically assess neurological maturation. Article states that reliability and validity were previously established in two earlier articles. They were excluded in the study because of length but cited (Vaire-Douret, 1997a, 1997b). This was performed within the first week after birth and at the time of discharge from the unit.

Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article–yes/no/NR [not reported]), and how frequently the measure was used.

**Psychomotor assessment:** A comprehensive examination of behavior, visual and auditory...
function, sensory/motor skills, postural control, and orthopedic lower-limb positions. The psychomotor assessment protocol included normed reference scores for each category. Using each individual score, the infant was assessed by comparing his or her score to the referenced norm, which was cited in Table 2 in the article. Article states that reliability and validity were previously established in two earlier articles. They were excluded in the study because of length but cited (Vaivre-Douret, 1997a, 1997b). Only the orthopedic lower limb examination of the psychomotor assessment was performed within the first week after birth. All subscale assessments were done at the time of discharge from the unit.

Measurement Biases
Were the evaluators blind to treatment status? Circle yes or no, and if yes, explain.

YES/NO Examiners were blind to infant’s group.

Recall or memory bias Circle yes or no, and if yes, explain.

YES/NO Examiners evaluated infants within the first week of birth and again at discharge. This amount of time eliminated any recall or memory bias from the examiners. Because the subjects were infants, they are naturally blind to the intervention and their assignment.

RESULTS
List results of outcomes relevant to answering the focused question.

Include statistical significance where appropriate (p < 0.05).
Include effect size, if reported.

Comparison between the control and treatment groups for the passive tone data showed a significant difference between treatment and control group in all categories (trunk extension/flexion, opisthotonos, extension of the forearm) with p values < 0.01. Sensory–motor skills were severely affected in control group with excessive muscular extension of the posterior axis of the body, which restricted movements such as rolling over and sitting up using lateral support of the arm. These findings also demonstrated a strong tendency in the control group towards abnormalities with excessive tone in the posterior muscles of the trunk and neck, revealing an imbalance between the extensor and flexor muscles. Abnormalities with odds ratios from all categories of the psychomotor assessment protocol (behavior, visual and auditory function, sensory–motor skills, postural control, orthopaedic lower limbs) favored infants from the treatment group with p values < 0.01.

Was this study adequately powered (large enough to show a difference)? Circle yes or no, and if no, explain.

YES/NO The results showed p values < 0.01 with n = 60.
Were appropriate analytic methods used? *Circle yes or no, and if no, explain.*

**YES/NO** Chi-squared was used for nonparametric data and *t* tests were used for parametric data.

Were statistics appropriately reported (in written or table format)? *Circle yes or no, and if no, explain.*

**YES/NO** The statistics stated above were all available in written format and some in table format. Written and table statistics were clear and understandable while figures lacked information for understandability.

**CONCLUSIONS**

State the authors’ conclusions that are applicable to answering the evidence-based question.

Regular changes in a preterm infant's positioning has a beneficial effect on development within the first few weeks of life. This is shown in this study by the better response made by the treatment group in neurological assessments: less excitability and movements that are easier to elicit. The control group showed abnormal muscle tone, which could interfere with behavior control such as overexcitability and difficulty in consolability. Control group exhibited excessive muscular extension of the posterior axis of the body which could eventually restrict movements such as rolling over and sitting up with arm support. Sensory–motor abnormalities were also seen in the control infant group. The differences between the groups were shown to be clinically meaningful in that the treatment showed it can decrease the occurrence of some of the neurological and psychomotor abnormalities that were seen where standard care is given.

**References:**


This work is based on the evidence-based literature review completed by Anne Stahl, OTS, and Patricia Scott, PhD, MPH, OT, FAOTA, Faculty Advisor, Indiana University–Purdue University Indianapolis.


For personal or educational use only. All other uses require permission from AOTA. Contact: [www.copyright.com](http://www.copyright.com)