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| **Author/Year** | **Study Purpose**  | **Subjects** | **Intervention/Description** | **Outcome Measure(s)** | **Results** | **Comments/****Limitations** |
| Monson, RM. 20031 | To describe the gross motor development of infants who slept supine and spent different amounts of time in the prone position when awake. | 30, six month old infants who were placed in supine to sleep since birth. All infants were full term at birth and had no medical complications.Infants were divided into the “prone” group or “no prone” group based on parent reported prone activity. | A PT administered the AIMS in the child’s home with a parent present. After the assessment, parents completed a questionnaire regarding wakeful prone positioning time, knowledge of tummy time recommendations and family demographics.  | AIMS, parent questionnaire  | Infants in the prone group scored significantly higher on the AIMS total raw score p =0.004 and percentile score p=0.003 compared to infants in the no prone group. | Homogenous, small convenience sample of 30 infants. Daily wakeful prone activity was estimated by parents via questionnaire which may not be reliable or valid. No prone group= prone 1 time or less per day, Prone group= prone 2+ times per day; duration not considered.  |
| Lee, HM. 20122 | To determine the effects of postural movement training on head control from 1 month old to 4 months old. | 22 full-term, healthy one month old infants. Infants were randomly assigned to the training group (6 male, 5 female) or the control group (8 male, 3 female). | Training group: caregivers were trained to lead their infants in specified developmental activities 20 minutes per day for 4 weeks starting at 1 month old. Tasks included both postural training, requiring increased use of neck, shoulder girdle, and trunk muscles, and movement training, requiring increased use of arm movements for reaching. Some examples include tummy time, baby sit-ups, midline toy grasp, and seated rocking out of BOS.Control group: Parents engaged their infant in social interaction 20 minutes per day for 4 weeks. Infants were placed in supine and parents visually and verbally interacted without presenting toys or touching the infant. | TIMP, Chair play kinematic data. Both were assessed 9 times over 3 months. The TIMP was performed in the home for the first 2 sessions and in the lab for the remaining 7; chair play was always assessed in the lab. | TIMP: Infants in the training group had significantly higher TIMP scores during the training phase (1-2 months of age) p=0.001, and these results continued in the post-training phase (2-4 months of age) p=0.000.Chair Play:During the treatment phase, training group infants maintained their head in an upright position rather than a leaning position significantly longer than control infants.During the post treatment phase, training group infants performed head “pop-up” and turning significantly more often than control infants. | Developmental activities outside of those assigned were not monitored. Parents in the training group may have participated in the developmental activities more than 20 minutes/day or beyond the 4 week intervention period. Therefore the “post training period” may have been contaminated with continued training. Conclusions cannot be made about long term effects after intervention has stopped. Only head control activities were assessed, it would be interesting to investigate effect on other gross motor skills such as reaching or supported sitting. |
| Vaivre-Douret, L. 20033 | To investigate the short-term effects of varied postnatal positions to prevent neuromuscular and postural abnormalities. | 60 low-risk pre-term infants of 31-36 weeks gestational age with no congenital or genetic disorders. All infants were patients in the Baudelocque neonatal unit during the study period. | Intervention group: Nursing staff repositioned the infants every 3-4 hours, equally varying between supine, prone and side lying on each side. A special, moldable mattress was used during supine and side lying to prevent skin breakdown and encourage proper head/trunk alignment. A bolster was placed under the hips in prone.Control group: Infants were placed in prone as was protocol in the unit (in 1994). Hand rolled sheets were used to position the pelvis and hips to avoid adduction and external rotation.  | Neurological Assessment Protocol- assesses tone, oculomotor function and primitive reflexes. Psychomotor Assessment Protocol- assesses behavior, visual/auditory function, sensory-motor skills, postural control, and lower extremity rest position.Infants were assess at birth and at discharge (avg. 38 weeks gestation) | Intervention group infants did not demonstrate any neurological or psychomotor delays (age adjusted) at discharge. Control group infants presented with muscular imbalances (extensors>flexors) and increase tone in the neck and trunk extensors. Additionally the intervention group infants scored significantly better on the behavior, visual/auditory, sensory-motor, postural control and lower extremity orthopedics psychomotor subscales compared to the control group infants (p=0.001). | There was no mention of the outcome measure psychometric properties or assessor blinding which may limit the clinical significance. At the time of the experiment the standard practice was prone positioning, however this is no longer the case since the Back to Sleep campaign. This study highlighted benefits to varying positions which is relevant to my capstone, however these results apply to premature infants which may not carry over to the typical Guatemalan infant. |
| Fetters, L. 20074 | To determine the effect of sleep and wake positioning on motor milestone achievement.  | 68 infants: 30 very-low-birthweight (VLBW) infants with preterm white matter disease (PTWMD; 21 males, 9 females), 21 VLBW infants without preterm WMD (PT; 13 males, 8 females), and 17 term infants (Term;7 males, 10 females) | Infants were assessed using the AIMS at 1, 5, and 9 months corrected age. During each assessment parents were interviewed about their child’s preferred positions during sleep, play and feeding. | AIMS, parent interview  | For all 3 groups sleeping prone was significantly positively correlated with higher AIMS scores at 1, 5 and 9 months of age. Playing in prone was significantly associated with higher AIMS scores at 5 months of age. Infant group was significantly associated with AIMS score at 5 and 9 months; Term infants scored significantly higher than PTWMD infants at 5 and 9 months. PT infants scored significantly higher than PTWMD infants at 9 months. | The inclusion of preterm, preterm with white matter disease and term infants is a benefit of this study. The results demonstrate positive influences of prone time across infants of differing developmental ability. Significant AIMS improvement was found at 5 months of age indicating that prone activity may be most important for infants from 1 month to 5 months of age. The use of parent interview to determine infant positioning is not reliable and may lead to an inaccurate representation of infant positioning. |
| Kennedy, E. 20095 | To compare motor development between infants with positional plagiocephaly (PP) and age matched peers without PP and to investigate the influence of infant positioning practices. | 27 infants between the ages of 3 and 8 months diagnosed with PP and 27 age, gender and race matched infants without PP | An experienced PT assessed each child using the AIMS and PDMS in the home. The parent recorded time spent in prone, supine and other positions each day for 3 consecutive days.  | AIMS, PDMS gross and fine motor subscales, parent diary | The mean percentile score on the AIMS was 31.1 ± 21.6 for infants with PP and 42.7 ± 20.2 for infants in the comparison group, this difference was not signiﬁcant (p = .06).There were also no significant between group differences on any PDMS subscales. There was a significant positive correlation between wakeful prone positioning and AIMS percentile score for infants with PP (p=0.01) and without PP (p=0.05). There was no difference in the amount of time spent in prone between groups. | The diagnosis of PP could not be related to increased time spent in supine as groups were equal regarding time spent in each position. This study used sound procedures; the evaluating PT was not involved in the study and was unaware of the purpose, both the AIMS and PDMS are valid and reliable measures, and the use of a diary is more valid and reliable than a questionnaire or interview. Sample size was determined based on achieving a power of 0.8 and accounting for drop-out. |
| Gerard, C. 20026 | To determine the effect of swaddling on arousal during sleep, sleep duration, and REM state sleep. | 26 healthy infants between 24 and 180 days old (mean 80+/-7 days). | Infants were observed during 2 day times naps; they were swaddled during one nap and not swaddled during the other (the order of swaddling was random). During sleep, the infants were monitored using a polygraph recorder, ECG, inductance plethysmography (respiratory movements), EMG in the R bicep, EEG, pulse oximeter, EOG (eye movement), and were videotaped for later review. | Sleep state- based on behavior, EEG, EOG, and respiratory measures. Arousal- based on sighs, EMG activity, eye opening and/or crying  | The frequency of startles was decreased with swaddling during quiet sleep (QS) (P<0.02) and REM sleep (P< 0.005) The frequency of behavioral arousals was decreased with swaddling during QS (P<0.001). The progression of sighs to startles was decreased in both QS and REM sleep by swaddling (P<0.003 and 0.0004) and the progression of startles to full arousal was decreased with swaddling in QS (P<0.006). The average REM sleep duration while swaddled increased (P< 0.0005) but total sleep duration and QS duration did not increase. | Researchers eliminated setting and monitor device impact on sleep by keeping all variables the same during swaddled and un-swaddled sleep for each child. Although total duration of sleep was unchanged, results indicate that the quality of sleep may be improved while swaddled. Swaddling should only be performed with supine sleeping- the results of this study may encourage parents to sleep their infant in supine as is recommended to reduce the risk of SIDS. |
| Kuklina, EV.20047 | To determine the effect of infant growth and diet on gross motor milestones in rural Guatemala. | 174 rural Guatemalan children were followed from birth to 3 years of age. | Attainment of gross motor milestones was assessed every month beginning at 3 months of age and ending with the achievement of independent walking. Length and weight were measured at birth, 15 days old and then once per month from 1 month to 15 months of age. Child illness was assessed biweekly by parent interview, and dietary intake was determined by 24 hour dietary recall over 3 consecutive days at 9 and 12 months of age. All assessments, measurements, and interviews were performed by trained Guatemalan field workers. | 17-milestone Gross Motor Development Scale, 24h dietary recall | The average age for achievement of unsupported walking was 15 months. Birth length and weight were not associated with walking onset age. However post natal growth (length and weight) was associated with earlier independent walking (p=0.005). Greater animal protein intake was also significantly associated with earlier walking, but no other nutritional factors impacted walking time.  | The study was included to investigate factors impacting motor development in Guatemala and the typical ages of milestone achievement in this population. Unfortunately, only independent walking was discussed and earlier milestones were not mentioned. A significant limitation of this study was the method of data collection. The assessments were performed by field workers rather than medical professionals therefore inaccuracies are likely. The inter-rater reliability in determining milestone achievement for this study was 85%. This is not a high level of reliability.  |

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