

## **Influence of sleep position experience on ability of prone-sleeping infants to escape from asphyxiating microenvironments by changing head position.**

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**Objective:** Several studies have found that back- or side-sleeping infants who are inexperienced in prone sleeping are at much higher risk for sudden infant death syndrome (SIDS) when they turn to prone or are placed prone for sleep compared with infants who normally sleep prone. Moreover, such inexperienced infants are more likely to be found in the face-down position at death after being placed prone compared with SIDS infants who are experienced in prone sleeping. We hypothesized that lack of experience in prone sleeping is associated with increased difficulty in changing head position to avoid an asphyxiating sleep environment.

**Methods:** We studied 38 healthy infants while they slept prone. Half of these were experienced and half were inexperienced in prone sleeping. To create a mildly asphyxiating microenvironment, we placed infants to sleep prone with their faces covered by soft bedding. We recorded inspired CO<sub>2</sub> (CO<sub>2</sub>I), electrocardiogram, and respiration, and we videotaped head movements. Also, we assessed gross motor development (Denver Development Scale).

**Results:** When sleeping prone, with their faces covered by bedding, all infants experienced mild asphyxia as a result of rebreathing. All aroused and attempted escape from this environment. Infants used 3 stereotyped head-repositioning strategies. The least effective was nuzzling into the bedding with occasional brief head lifts. More effective were head lifts combined with a head turn. Some infants, however, could turn only to 1 side, right or left. Infants who were inexperienced in prone sleeping had less effective protective behaviors than experienced infants. Infant age did not correlate with efficacy of protective behaviors. Infants who were experienced in prone sleep had advanced gross motor development compared with inexperienced infants.

**Conclusion:** Infants who are inexperienced in prone sleeping have decreased ability to escape from asphyxiating sleep environments when placed prone. These observations potentially explain the increased risk associated with prone sleep in infants who are inexperienced. The increased occurrence of the face-down position in such infants is also potentially explained. These findings suggest that airway protective behaviors may be acquired through the mechanism of operant conditioning (learning).