



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Jereen Kwong	Project Number S1110
Project Title Just Add Weight: The Relation between Upper-Extremity Weight-Bearing and the Development of Thumb Opposition in Infants	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Human infants are not born with the ability to move their fingers independently or rotate the thumb so that the pad of the thumb is opposed to the pad of the index finger. From 6-12 months of age, infants' grasping patterns improve rapidly and become increasingly precise, primarily due to increased involvement of the thumb. This study investigated whether the specific experience of repeatedly weighting the hands when crawling on hands-and-knees facilitates the development of thumb opposition in infants 9.5 and 10.5 months of age.</p> <p>Methods/Materials The sample included 42 infants who had been crawling for different lengths of time. To determine the area of weight-bearing (pressure) on the hands, the undersides of infants' hands were videotaped as they crawled across an elevated Plexiglas surface. Weight-bearing was defined as the total area of pressure in mm² on the right and left hand/total area of the two hands during maximum weight-bearing. Thumb opposition was assessed individually for each hand by examining thumb involvement as the infants grasped and lifted an alphabet cube.</p> <p>Results As predicted, a one-way ANOVA revealed a significant positive association between total area of weight-bearing on the hands and finger/thumb opposition score. Further work is needed to determine if the link between weight-bearing and thumb opposition is causal. A Chi-square analysis revealed significant positive association between weeks crawling and finger/thumb opposition score. In contrast, an analysis of the relation between age and finger/thumb opposition score did not reach significance. Although it is possible that brain maturation could account for both crawling and thumb opposition in this sample, similar scores between 9.5- and 10.5-month-old infants suggest that this explanation is unlikely. Taken together, these findings suggest that the experience of weighting the hands repeatedly over many weeks may facilitate the development of finger/thumb opposition and infant hand development.</p> <p>Conclusions/Discussion Finger/thumb opposition is essential to the precision with which we grasp. Although weight-bearing is currently used as a treatment technique by pediatric physical and occupational therapists to improve hand function in children, this study is one of the first to provide evidence that the technique may have value.</p>	
Summary Statement The longer infants have been crawling (regardless of whether they are 9.5 or 10.5 months of age) the higher their finger/thumb opposition scores, suggesting that weight-bearing experience may facilitate the development of thumb opposition.	
Help Received Beginning in June of 2006, I have participated as a high school intern in Stanford University Neurodevelopmental Laboratory. My project is part of a larger study on infant motor development. Dr. Kermoian taught me how to develop my research idea into testable hypotheses, conduct statistical	