Hip Mechanics of Infants: Understanding Hip Angles of an Infant in Different Baby Carrier Styles

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Transcript

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Hi, my name is Sarah Goldrod, and I'm an undergraduate student studying mechanical engineering and biomedical engineering. I work for Dr. Erin Manning in her research lab called the Boise Applied Biomechanics of Inference Laboratory, with Dr. Safeer Siddicky. I conducted a research study on infant hip mechanics, and the purpose of this study was to develop testing methods to accurately measure those infant hip angles when infants were placed in various baby carrier styles. The infant position and these different baby carrier styles can affect their hip development and their health. And what we used to compare our results to is the Pavlik Harness. That's a device used to treat developmental dysplasia of the hip. The Pavlik Harness is basically the standard for healthy hip position. The optimal position of the infant hip angle is about 90 degrees of flexion and 80 degrees of abduction.

Three inward-facing baby carriers were placed on an adult mannequin, and one of these baby carriers was also able to position the baby so it was facing outwards. We used an infant mannequin that represented a newborn baby that weighed about 2.83 kilograms. We were able to measure the hip flexion and abduction angles using a goniometer, by labeling anatomical landmarks. And the flexion angles were also calculated again through a MATLAB photo analysis function. We measured the maximum force, peak pressure, and mean pressure that the carrier exerted onto the infant during our first trial, using two Novel pressure sensors. One of them was placed around the thigh of the infant mannequin, and the other one was placed around the back, in the gluteus maximus.

The Novel data turned out to be very inconsistent, and unreliable to measure the forces that were exerted onto the infant mannequin, so we ended up not using that data for this study. Carrier B's data resulted in the most similar hip position to the Pavlik Harness, while Carrier C's data proved to us that it does not support the infant's hips for healthy positioning or development.

About 75% of the photo analysis data resulted in smaller flexion angles compared to the

measured angles using the goniometer. Labeling the anatomical landmarks for the photo analysis method was accessible and consistent, but it actually was difficult to measure the angles with the goniometer because of its shape and the positioning of the infant while it's in the baby carrier. A possible method for measuring hip flexion and abduction more accurately is to embed a digital goniometer in the infant mannequin.

At this point, you might be asking yourself again, "What was the purpose of this study?" Well, this preliminary data collection will lead us to more advanced and detailed research with human subjects. Eventually, we actually want to be able to create a standard for new baby carrier designs, and we will be able to do this once the optimal baby carrier style for hip position is identified. Thank you so much for listening, and feel free to ask any questions you might have.

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