AmTryke Research Summaries

The following are summaries of research conducted on various aspects of the AmTryke.

"The Effects of Therapeutic Tricycle Riding on Gait and Endurance for Three Children With Spastic Diplegic Cerebral Palsy"
By Jenna A. Lisenby and Angela D. Spooner
Pacific University School of Physical Therapy

Background and purpose: The purpose of this study was to quantitatively evaluate the effects of the AmTryke therapeutic tricycle on function, gait parameters, and physical endurance of three children with spastic diplegia. Children with spastic diplegic cerebral palsy have demonstrated observable and quantifiable endurance and strength deficits in their lower extremities. Due to weakness and spasticity, children commonly walk with a "scissoring" pattern. The goals for most families and physical therapists include strengthening the lower extremities to produce more typical gait pattern, and prevent future deformity with better alignment during functional activities. Tricycle riding is often designated as therapeutic, and is theoretically a tool to encourage muscle stimulation and strengthening in a typical pattern of co-activation and reciprocal LE function.

Methods: Three children with diagnosis spastic diplegia, ages five through nine, were chosen from a sample of convenience. They were evaluated with the GMFM and GAITRite® gate mat over the course of six months, using a single subject ABAB design to determine if any gait changes occurred with therapeutic tricycle riding. Weight, height, leg length, heart rate and subjective measures were utilized to provide additional information to correlate with any changes observed.

Results: Subjects one and two increased in gross motor functional measurements over the course of the study. Subject number one received botulinum toxin injections during the second baseline. Subject number two had observable trends of increased function during therapeutic tricycle riding phases. Subject three gained twelve pounds and declined in function from the onset of the study, both quantitatively and qualitatively. All three children and families subjectively viewed the tricycle riding as socially and physically beneficial.

Discussion and Conclusions: Trends for subjects one and two suggested that the therapeutic tricycle had strengthening effects on gait which allowed for greater velocity, cadence and increased time in single limb stance. These trends could not be deemed as statistically significant due to large variations in initial baseline gait parameter measurements. For subject three, there did not seem to be any trend to indicate that tricycle riding affected his general decline in

function. For all subjects, the therapeutic tricycle was a beneficial tool from a psychosocial perspective. It would be beneficial to replicate the design of this study and further investigate tricycle-riding effects on gait and endurance for children with spastic diplegic cerebral palsy. It may also be valuable to study the effects of strengthening with the tricycle in children with spastic diplegia after botox injections.

"Physiological Responses of Children with Spina bifida During Arm and leg Exercise Using The AmTryke"
By Janet Mulcare, Ph.D., Jennifer M. Conrad, M.P.T., Mary I. Herandez, M.P.T., and Daniel J. Fleming.
Andrews University Masters of Physical Therapy Program

There have been numerous studies on healthy children regarding the benefits of regular exercise, but very little research on exercise response of disabled pediatric populations. The purpose of this study was to measure physiological responses of children with spina bifida during arm and leg exercise using the AmTryke tricycle. The sample consisted of five children 6-7 years old, who have been diagnosed with spina bifida. Their level of lower leg muscle weakness and paralysis carried. They had no other significant bone or muscle problems that affected their participation. All of the children were currently involved in either organized or recreational activities including such activities as ballet, swimming, running, bike riding, baseball and school physical education classes. Four of the five children wore bilateral ankle foot orthoses to normalize their walking and increase their ability to be active at school and play.

Methods: Subjects pedaled the AmTryke on a stationary set of rollers. Oxygen use and heart rate were measured during a five-minute ride.

Results: The average amount of energy use was 17.21 ml/kg/min and mean energy cost was 0.357 ml/kg/meter, which is more efficient that previously reported values of walking with crutches in this type of population.

Conclusions: Although generalizability of these findings is limited by a small sample size, it does appear that this arm and leg geometry is more efficient exercise than reported values for walking with orthoses. As such, the AmTryke is an efficient exercise for children with spina bifida and is a useful tool in the pediatric physical therapy setting, as well as for home use.