Mobility Devices for Early Intervention

Numerous studies indicate the appropriateness of early mobility devices with young children. This document is a summary of much of this research, as well as a compilation of expert opinion from many of the providers who are recommending this equipment in Colorado.

The Importance of Early Mobility

Cognitive

1. Children who move independently through space score higher on tests of cognition, particularly visual skills.
Kermoian R, Campos JJ. Locomotor experience: a facilitator of spatial cognitive development. *Child Deve.* 1988; 59 (4): 908-17.

2. In infants who were at the same developmental level and chronological age, those who used augmentative mobility scored higher on tests of object permanence.
Bell MA, Fox NA. Individual differences in object permanence performance at 8 months: locomotor experience and brain electrical activity. *Deve Psychobiol.* 1997; 31 (4): 287-97.

3. When children gain independent mobility for the first time through a wheelchair, they also score higher on tests of cognition.
Angulo-Barroso RM, Wu J, Ulrich DA. Long-term effect of different treadmill interventions on gait development in new walkers with Down syndrome. *Gait Posture.* 2007; 27 (2): 231-8.

4. When children move independently, they are faced with a complex set of spatial problems such as not colliding with obstacles, not falling off the edge of the stairs, and remembering how to get from place to place, all of which improve cognition and perception.
Kermoian R, Locomotor experience and psychological development in infancy. *Pediatric Powered Mobility: developmental perspectives, technical issues, clinical approaches.* 1997; 7-12. Washington DC: RESNA Press.
(Even though the article focuses on powered mobility, the conclusions presented were also generalized to independent mobility with any mobility device).

5. Infants who do not have functional mobility cannot locate hidden objects (lack of object permanence), are not appropriately wary of heights and are more dependent than their peers on vision to control their posture.
Bai D, Bertenthal B. Locomotor status and the development of spatial search skills. *Child Development*, 1992, 63: 216-226.

Psychosocial

1. Mobility impacts a child's ability to learn and participate fully in the world by dramatically increasing the child's independence

Biringen A, Emde RN, Campos JJ, Appelbaum MI. Affective reorganization in the infant, the mother, and the dyad: the role of upright locomotion and its timing. *Child Develoment,* 1995, 66: 499-514.
Campos JJ, Bertenthal B, Kermoian R. Early experience and emotional development: the emergence of wariness of heights. *Psychological Science,* 1992. 3: 61-64.

2. Early independent mobility helps to avoid learned helplessness, formulate sense of identity, confidence, and reduce apathy and depression
Butler, C. Augmentative mobility. Why do it? *Physical Medicine and Rehabilitation Clinics of North America.* 1991. 2 (4), 801-815.
McDermott JF, Akina E. Understanding and improving the personality development of children with physical handicaps. *Clinical Pediatrics.* 1972. 11, 130-134.
Kohn M. Social competence, symptoms, and under-achievement in childhood: a longitudinal perspective. 1997. New York: Wiley.

3. Learned helplessness is firmly established in children by four years of age who have not had functional mobility.
Butler, C. Augmentative mobility. Why do it? *Physical Medicine and Rehabilitation Clinics of North America.* 1991. 2 (4), 801-815.

4. Children who have independent mobility become more active and engaged in the world.
Butler C. Effects of powered mobility on self-initiated behaviors of very young children with locomotor disability. *Developmental Medicine & Child Neurology.* 1986. 28: 325-332. (Even though the article focuses on powered mobility, the conclusions presented were also generalized to independent mobility with any mobility device).

5. Children who have independent mobility demonstrate increased spontaneous vocalizations, improved sleep habits, improved disposition, increased participation in educational programs and increased ability to interact meaningfully with peers.
Deitz J, Swinth Y, White O. Powered mobility and preschoolers with complex developmental delays. *American Journal of Occupational Therapy.* 2002. 56: 86-96. (Even though the article focuses on powered mobility, the conclusions presented were also generalized to independent mobility with any mobility device).
Furumasu J, Guerette P, Tefft D. Relevance of the pediatric powered wheelchair screening test for children with cerebral palsy. *Developmental Medicine & Child Neurology.* 2004. 46: 468-474. (Even though the article focuses on powered mobility, the conclusions presented were also generalized to independent mobility with any mobility device).

6. When mobility is not addressed early enough in a child's development, passiveness often occurs, effecting the child's motivation, which can delay proficiency with a mobility device.
Butler C, Okamoto GA, McKay TM. Powered mobility for very young disabled children. *Developmental Medicine & Child Neurology.* 1983. 25(4): 472-474.

(Even though the article focuses on powered mobility, the conclusions presented were also generalized to independent mobility with any mobility device).

Language

1. Infants with Down Syndrome who were taught to walk early did better on tests of receptive language.
Ulrich DA, Ulrich BD, Angulo-Kinzler RM, Yun J. Treadmill training of infants with Down syndrome; evidence-based development outcomes. *Pediatrics.* 2001; 108 (5): E84.

Motor

1. When children with Spina Bifida walked using augmentative mobility even for a brief period of time, they were more likely to be able to transfer and catheterize themselves, than if they had not.
Mazur JM, Shurtleff D, Menelaus M, Colliver J. Orthopaedic management of high-level spina bifida. Early walking compared with early use of a wheelchair. *J Bone Joint Surg Am.* 1989; 71 (1): 56-61.

Vision

1. Independent mobility impacts a child's visual development by providing visual experience for cortical development, spatial relationship comprehension, development of depth perception and provision of vestibular information.
Nawrot M. Disorders of motion and depth. *Neurologic Clinics of North America.* 2003.l 609-629.

More and more evidence suggests that children who are given augmentative mobility before age 2 do better in many areas of function. If the child already has delays, we are compounding them by allowing the child to remain stationary and miss opportunities to explore and interact with the environment
Paleg, G. Moving forward: new products can help kids' cognition through enhanced mobility. *Rehab Management.* 2008, 16-19.

Specific studies relating to mobile standers

1. Research has shown many benefits from standing. In young children, one important benefit is increased acetabular depth. Many children with cerebral palsy are spastic and at increased risk of hip dislocation or subluxation. Increased acetabular depth helps keep the hip in the socket.
Stuberg W. Considerations related to weight-bearing programs in children with developmental disabilities. *Phys Ther.* 1992;72(1):35-40.
Gajdosik C, Gajdosik R. Musculoskeletal development and adaptation. In: Campbell S, ed. *Physical Therapy for Children.* Philadelphia: WB Saunders Company; 1994:105-126.

2. Standing can also help improve bone density, decrease joint contractures and spasticity, increase leg strength, improve cardiopulmonary function, and improve digestion in both children and adults.

Stuberg W. Considerations related to weight-bearing programs in children with developmental disabilities. *Phys Ther.* 1992;72(1):35-40.
Walter J, Sola P, Sacks J, et al. Indications for a home standing program for individuals with spinal cord injury. *J Spinal Cord Med.* 1999;22(3):152-158.

When looking at children using mobility devices, we need to determine what is meant by "moving" and our expectations for these children. Normally developing children start exploring their environment at 3-4 months of age via reaching and rolling. Creeping at 7-9 months of age allows discovery of further distances, with resultant changes in perceptual, cognitive and socio-emotional behavior. At 12-13 months, children typically begin to walk. Therefore, utilization of mobility devices at similar ages is also recommended for appropriate children to enable them to explore the environment and, in turn, to continue to develop motor and cognitive skills.

Young children using mobility devices need to be supervised just like their non-disabled peers. Using a mobility device has safety implications. Children have a natural curiosity, but not necessarily the understanding of what harm or danger can accompany the task. These concerns, however, should not stop a clinician or parent from allowing and encouraging a child to use a mobility device, but rather serve as a reminder to pay special attention to safety.

Evaluation of the young child for a mobility device requires comprehensive evaluation by a qualified provider to make appropriate recommendations and match specific child needs to the most appropriate equipment and components.

Early utilization of mobility devices for the appropriate child enhances independence, improves psycho-social development, and enables children to grow to become productive and integrated members of society. Without efficient, independent mobility, children may develop learned helplessness and experience delays in both physical and cognitive domains. Mobility can provide the child with the opportunity to attend and fulfill all daily tasks as typically expected from their non-disabled peers. Age, limited vision or cognition, parental concerns or the ability to utilize other means of mobility for very short distances should not, in and of themselves, eliminate a child as a candidate for mobility devices.