Kids in Motion: Early power mobility
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1. Participants will be able to describe at least four benefits for children who use power mobility in the preschool years.
2. Participants will be able to describe at least three different groups of children who can benefit from early introduction of power mobility.
3. Participants will be able to compare and contrast the features and benefits of at least three different power mobility devices suitable for toddlers and preschool children.

Toddlers who are typically developing take 10,000 steps a day (Adolph et al., 2012) and spend about 6 hours each day actively moving and exploring (Ishikawa et al., 2013). Children with disabilities who are unable to move around and actively explore their environment develop passive, dependent behaviours, and are at increased risk for overall developmental delays (Butler, 1991). The brain’s ability to develop and form connections in the sensory and motor areas peaks at two-years-of-age (Armfield et al., 2013), therefore it is very important that children who are not moving independently by 12 months-of-age have opportunity for independent mobility experience using power mobility (Livingstone & Paleg, 2013). Power mobility experience can be provided through the use of switch-adapted ride-on toy cars, electrically powered mobility training devices and loaned or shared child-sized power wheelchairs.

There are four groups of children who can benefit from use of power mobility (Hays, 1987):
- Children who will never walk e.g. those who have significant movement problems related to a medical condition such as cerebral palsy or spinal muscular atrophy,
- Children who have inefficient mobility e.g. those who cannot keep up with their peers despite using mobility aids such as canes, crutches, walkers or manual wheelchairs,
- Children who need mobility assistance in early childhood e.g. those who are not able to move easily or keep up with peers in the first few years of life but who are expected to walk eventually due to surgical interventions, or use a manual wheelchair well when older,
- Children who lose the ability to walk due to injury, illness or disease.

Children as young as 14 months of age can begin learning to maneuver a power wheelchair (Jones et al., 2012) and a number of studies have described children developing competent use of a power wheelchair between the ages of 18 and 24 months (Butler et al., 1983, 1984; Jones et al., 2003; Everard, 1984; Dunaway et al., 2012). Other studies have explored use of specialized power mobility devices with infants as young as 7 months-of-age (Galloway et al., 2008; Lynch et al., 2009).

The following information is partly based on a systematic review of power mobility outcomes for children found in the research literature (Livingstone & Field, 2013). We used the International Classification of Functioning, Disability & Health, or ICF for short (WHO, 2001) to organize the benefits of power mobility.

The ICF framework identifies the relationship between a health condition (e.g. a diagnosis such as cerebral palsy or spinal cord injury) and other aspects of functioning, classified as (i) Body structure and function, (ii) Activity and (iii) Participation. This is a model used with all people, not just people with disabilities. The health condition may result in an impairment at the body structure and functioning level (e.g. someone with a spinal cord injury has an interruption
in the integrity of the spinal cord that disrupts the neural pathway connecting the brain to the nerves and muscles of the limbs). This may result in an activity limitation—such as the individual’s ability to walk, maintain an upright sitting posture, or use their hands (many of our therapeutic assessments and interventions address this level of functioning). There may also be a restriction in the person’s ability to participate in everyday life activities they want or need to do. These activities may involve home life, school life or being engaged in their community. The ICF framework acknowledges the relationship that environmental factors and personal factors have on an individual’s functioning. Environmental factors are factors occurring outside of the person (like the physical environment or the people around them), while personal factors are internal to the person (like personality, age, gender).

We used the American Academy of Cerebral Palsy and Developmental Medicine (AACPDM) levels of evidence (AACPDM, 2008) to rate the strength of evidence supporting the outcomes we found in the literature. The AACPDM rating goes from level I to V, with level I representing the highest level of evidence (or degree of certainty that the outcome has resulted from the intervention used), and V representing the lowest level of evidence. Most of the evidence for power mobility outcomes is descriptive and either level IV (often small group research) or level V (usually case studies or expert opinion). The highest level of evidence we found for power mobility outcomes are at a level II (Jones et al., 2012) and a level III (Butler, 1986). Qualitative research evidence is not included in the AACPDM rating. However, this type of research is extremely valuable as it often captures children’s opinions or parents’ experiences with their children’s use of power mobility.

**Body Structure and Function related outcomes:**
- Power mobility can have a positive impact on children’s overall development including cognitive and receptive language skills
  (Jones et al., 2012 [Level II]; Lynch et al., 2009 [Level V])
- sleep/wake cycle (Tefft et al., 2011 [Level IV])
- level of alertness and motivation (Nilsson & Nyberg, 2003 [qualitative evidence])

**Activity related outcomes:**
- Power mobility can increase children’s level of independence
  (Bottos et al., 2001 [Level IV]; Douglas & Ryan, 1987 [Level V])
- ability to initiate movement (Butler 1986 [Level III]; Deitz et al., 2002 [Level IV])
- understanding of cause-effect (Nilsson & Nyberg, 2003 [qualitative evidence])
- use of their arms and hands (Nilsson & Nyberg, 2003 [qualitative evidence])

There is a common fear that when children use power mobility, they will lose interest in trying to learn to walk or to develop their motor skills. However, research evidence suggests that there is no negative impact on motor development when children use power mobility.

**Participation related outcomes:**
- Power mobility can have a positive impact on children’s play and social skills
  (Guerette et al., 2013 [Level IV]; Tefft et al., 2011 [Level IV])
- peer interactions (Ragonesi et al., 2010 [Level V]; Ragonesi et al., 2011 [Level V])
- personal-social and communication skills (Jones et al., 2003 [Level V])
- peer relationships (Everard, 1984 [Level V]; Wiart et al., 2004 [qualitative evidence])
**Barriers and facilitators of power mobility use:**

Parents may initially be reluctant to consider power mobility for their child, especially if it is seen as giving up on other methods of mobility. However, research shows that most parents have positive views once they see the impact on their child’s level of independence and ability to participate with other children (Bottos et al., 2001 [Level IV]; Wiart et al., 2004 [qualitative evidence]).

Parents have described that other adults see their children as being more capable when they use power mobility (Tefft et al., 2011 [Level IV]; Everard, 1984 [Level V]) and that their children are able to develop more typical peer relationships (Wiart et al., 2004). Children who are given more support and practice in using a power mobility device are more successful in learning power mobility skills (Bottos et al., 2001 [Level IV]; Nilsson et al., 2010 [qualitative evidence]). Professionals working with families of children with disabilities can either be barriers or facilitators of this acceptance (Wiart et al., 2004 [qualitative evidence]). Professionals should present power mobility as one mobility option that can be used to help children access different environments and activities (Livingstone & Paleg, 2013; Casey et al., 2013; Wiart, 2011).

**Power mobility options:**

- Switch-adapted ride-on toy cars – see www.udel.edu/gobabygo/
- Boss car, Gokart, and STS mobility device (new version of Gobot) www.mobility4kids.com
- Scooterboard – see www.enablingdevices.com
- Paediatric power wheelchairs – see www.invacare.com

Independent mobility experience is beneficial for all children and does not interfere with the development of motor skills. Some children may go on to learn to walk or to use a manual wheelchair when they are older, but the opportunity to use power mobility when young may stimulate interest in independent mobility and facilitate exploratory behaviours. Power mobility is one of several therapeutic options available to provide independent mobility experiences.

**References:**


