The Power to Transform Development: Benefits of Power Mobility Devices for Children 0-3 Years

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Background

- Pediatric power mobility devices (PMD) include power wheelchairs, ride-on toy cars, and robotic devices.[1]
- Children with mobility needs can learn as young as **7 months old**.[2]
- Children ages 0-3 years is a critical window for development.
- Early access to PMD promotes positive development for children.[3,4]
  - Develops **self-initiated movement**.[4]
  - Enhances occupational participation and client factors.[4]
  - Promotes psychosocial development (Erickson's).[4]
    - Children becoming self-sufficient or doubting their own abilities.[4]
- Challenges to PMD usage in early childhood include:
  - Parents demonstrate resistance to use PMD.[5,6]
  - Providers have limited knowledge
    - Holistic benefits.[5]
    - Ability to effectively implement PMD.[5]
  - PMD are often not prescribed until children reach school age because of limited device options, lack of access, safety concerns and the prevailing belief that power mobility should be a last resort.[5]

The purpose of this poster is to describe the benefits of PMD for children 0-3 years old and to provide evidence-based recommendations for prescription and usage.

Methods

1.Form PICO question:

What are the benefits of PMD for children ages 0-3 years?

2.Search journal databases

3.Select most relevant articles

4.Deconstruct article findings and develop themes

5.Interpret clinical implications and identify areas for further research

6.Disseminate work to audience

Search Terms and Databases

Databases	CINAHL, Google Scholar, PubMed, SCOPUS, OT Search
Search Terms	Infant, Toddler, Child, Early, Baby, Development, Power mobility, Power wheelchair, Power car, Power toy, Ride-on Toy car, Modified car, Mobility aid
Inclusion Criteria	Published in past 16 years, Peer reviewed, Majority of participants ages 0-3 years old with any mobility impairment, Articles published in US and internationally, Articles written in English
Exclusion Criteria	Majority of participants over 3 years old, Articles focused on manual wheelchairs

Recommendations for Providers

- The Rehabilitation, Engineering, and Assistive Technology Association Society of North America (RESNA) **outlined guidelines** for promoting PMD for children between the ages of 0-3 years.[7]
  - Introduce PMD in alignment with typical motor milestones.[8]
  - Recommend PMD that is **adaptable, flexible, durable, low-cost, aesthetically pleasing and accessible**.[5]
  - Utilize a **family-centered and context-focused approach** when suggesting, designing, and implementing the child's use of PMD in meaningful activities.[9]
  - Provide **intensive training** with the child and family increases use and competence.[10]

Analysis of the Evidence

Citations	Evidence Level	PMD Type	Age of Subjects	Benefits
Dunaway, Montes, O' Hagen, Sproule, De Vivo & Kaufmann, 2012	III	PW	0 yrs - 2 yrs	F
Evans & Baines, 2017	III	W	1 yr 3 mos - 6 yrs	E
Galloway, Ryu & Agrawal, 2008	III	R	7 mos - 1 yr 3 mos	F
Guerette, Furumasu & Tefft, 2013	III	PW	1 yr 6 mos - 6 yrs	F, P, S
Huang, 2018	V	U	0 yrs - 3 yrs	F
Huang & Chen, 2017	II	C	1 yr - 3 yrs	F
Huang, Chen, & Huang, 2017	III	C	1 yr - 3 yrs	E, F, S
Huang, Chen, Huang, Shih, Hsieh & Chen, 2018	II	C	1 yr - 3 yrs	F, S
Huang, Ragonsei, Stoner, Peffley & Galloway, 2014	IV	C	2 yrs	E, F, P, S
Jones, McEwen, & Hansen, 2003	V	PW	1 yr 5 mos	A, C, F, P, S
Jones, McEwen, & Neas, 2012	I	PW	1 yr 2 mos - 2 yrs 6 mos	A, F, S
Kenyon, Farris, Aldrich & Rhodes, 2017	IV	PWT	3 yrs	C, F, M, S
Kenyon, Farris, Gallagher, Hammond, Webster & Aldrich, 2017	III	PWT	5 mos - 3 yrs	C, F, M, S
Logan, Catena, Sabet, Hospodar, Yohn, Govindan, & Galloway, 2019	III	SC	7 mos - 9 mos	E, F
Logan, Feldner, Galloway, & Huang, 2016	IV	C	6 mos - 5 yrs	E, F
Logan, Huang, Stahlin, & Galloway, 2014	IV	C	1 yr	A, F, S
Lynch, Ryu, Agrowal, & Galloway, 2009	IV	R	7 mos	C, F, S
Ross, Catena, Twardzik, Hospodar, Cook, Ayyagari… Logan, 2017	IV	C	1 yr - 3 yrs	P, S
Stansfield, Dennis, Altman, Smith, & Larin, 2018	II	We	5 mos - 10 mos	F
Stokes, Cook, Sanders, & Coker-Bolt, 2014	IV	C	1 yr 6 mos	F, C, S
Tefft, Guerette, & Furumasu, 2011	III	PW	1 yr 6 mos - 6 yrs	F, P, S, R

Power Mobility Device (PMD)
PW: Power Wheelchair
PWT: Power Wheelchair Trainer (Device that converts manual wheelchair to power wheelchair
W: Wizzybug
We: Weebot
C: Ride-on toy car
SC: Standing ride on toy car
R: Mobile Robot
U: Unspecified power mobility device

Occupations
A: ADLs
F: Functional Mobility
P: Play
R: Rest and Sleep
S: Social Participation

Client Factors
M: Global Mental Functions *(Temperament and Personality→ **Motivation**)*
E: Specific Mental Functions *(Emotional→ **Enjoyment**)*
C: Specific Mental Functions *(Higher Level **Cognitive**, Attention, and/or Memory)*

Levels of Evidence

Level I: Systematic reviews, randomized control trials
Level II: Two groups, nonrandomized studies
Level III: One group, nonrandomized
Level IV: Descriptive studies that include analysis of outcomes, case studies
Level V: Case reports, expert opinions

Results

- Children ages 0-3 years with impaired locomotion can benefit from PMD. In 21 studies, participants had a **variety of conditions** (some articles and conditions may be represented in multiple categories):
  - Neurological (14/21 articles)
  - Genetic (10/21 articles)
  - Developmental (9/21 articles)
  - Orthopedic (3/21 articles)
  - Unspecified (3/21 articles)
- Participants used a **variety of PMD**:
  - Ride-on toy cars (8/21 articles)
  - Power wheelchairs (5/21 articles)
  - Power wheelchair trainers (2/21 articles)
  - Mobile robots (2/21 articles)
  - Unspecified (1/21 articles)
  - Standing ride-on toy cars (1/21 articles)
  - Wizzybugs (1/21 articles)
  - Weebots (1/21 articles)
- Access to early power mobility **improved occupational performance** and participation in the following realms:
  - Functional mobility (19/21 articles)
  - Social participation (13/21 articles)
  - Play (5/21 articles)
  - ADLs (3/21 articles)
  - Sleep (1/21 articles)
- Furthermore, participants exhibited **improvements in client factors**:
  - Specific mental functions → higher level cognitive skill (5/21 articles)
  - Specific mental functions → enjoyment (5/21 articles)
  - Global mental functions→ motivation (2/21 articles)
- In addition, research showed that access to early power mobility can **decrease parental stress** (3/21) and increase parental belief that the public accepts their child (1/21).

Discussion

- The use of PMD for children ages 0-3 years can yield significant benefits. Children with early access to PMD have enhanced participation in childhood occupations, improved client factors, and reduced parental stress.
- Parents are often resistant to early use of PMD due to feelings of grief and loss associated with their child's lack of typical mobility.[6,11]
- A client-centered approach may help parents/caregivers experience the developmental, physical, and social benefits of PMD for their young child.

Future Implications

- **Expand** research studies **beyond feasibility** and address quality of life, additional occupation performance areas including sleep, and the impact on various client factors.
- Develop **continuing education** opportunities to help providers be aware of the benefits associated with access to early power mobility devices.
- Create resources to help providers and families advocate for the use of early power mobility devices.

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