



School-based Safety-focused Power Wheelchair Driving Intervention Traffic Light

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PICO

In children & adolescents with major motor impairments, does a school-based safety-focused power wheelchair driving intervention improve safety in driving?



Searching for Evidence

Search Database Sources

- Trip Database
- MEDLINE
- CINAHL
- Google Scholar

Search Terms

- outdoor
- power* mobility /power* wheelchair
- safety
- driver training
- child*
- parent*
- experience*



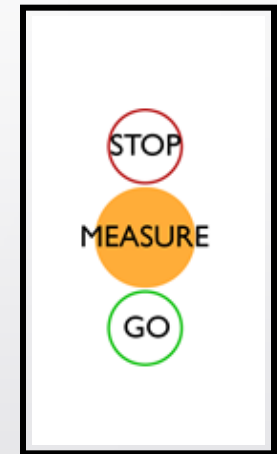
Searching for Evidence

- Search was replicated by:
 - Andrea Ryce, SHH clinical librarian
 - Susan Harris, through TL vetting process



Best Evidence Identified

- No applicable article(s) found
- Yellow – No evidence found



- Traffic Lighting Database:

http://10.2.50.68/fmi/iwp/res/iwp_home.html



Broader Evidence

- No salient quantitative paediatric articles found
- However 7 related research articles found and used as supporting evidence
 - 3 adult
 - 4 pediatric



Summary of Broader Evidence

– ADULT LITERATURE (3)



1) Chen, W. Y., Jang, Y., Wang, J. D., Huang, W. N., Chang, C. C., Mao, H. F., & Wang, Y. H. (2011). Wheelchair-related accidents: relationship with wheelchair-using behavior in active community wheelchair users. *Archives of Physical Medicine and Rehabilitation*, 92(6), 892-98

- Primary research article (quantitative)



Findings:

Adult manual & power wheelchair users:

- Maintenance & support important

If wheelchair not maintained or supported by a therapist,
then drivers at greater risk of being in an accident

- odds ratio 11.28; 95% confidence level, 2.62 – 48.61

- Active manual wc users more likely to tip & fall

Examples: young male, spinal cord injury, spina bifida;
higher motor function, etc.



Findings:

- Most accidents associated with tips & falls (related to the person, wheelchair or context/environment)
- Greater chance of tips & falls during transfers, reaching, driving up & down slopes due to inexperience and uneven surfaces such as tree roots
- Operational or electronic malfunctions also related to increased chance of tips & falls & being hit by other moving vehicles



2) Corfman, T. A., Cooper, R. A., Fitzgerald, S. G., & Cooper, R. (2003). Tips and falls during electric-powered wheelchair driving: effects of seatbelt use, legrests, and driving speed.

Archives of Physical Medicine and Rehabilitation, 84(12), 1797-1802

- Primary research article (quantitative)



Findings:

Adult power wheelchair users:

- Tips & falls accounted for most injuries
- Accidents, including tips, falls & loss of control, often attributed to improper use & installation of safety equipment such as foot supports & seatbelt
- Seat belt use influenced outcome of tip or fall; drivers 3 X more likely to fall if not wearing a seat belt
- Curb cuts, thresholds & ramps=potential safety risks



3) Rice, L. A., Ousley, C., & Sosnoff, J. J. (2015).
A systematic review of risk factors associated
with accidental falls, outcome measures and
interventions to manage fall risk in non-
ambulatory adults. *Disability and
Rehabilitation*, 37(19), 1697-1705

- Systematic review



Findings:

Adult manual & power wheelchair users:

- Systematic review included 11 studies that confirmed risk factors associated with tips & falls
 - Examples: equipment factors, environment, transfers, reaching, etc.
- Most of the 11 studies addressed manual wheelchair use, however both preceding power wheelchair studies were included (Chen et al., 2011; Corfman et al., 2003)



Summary of Broader Evidence

– PAEDIATRIC LITERATURE (4)



1) Evans, S., Neophytou, C., De Souza, L., & Frank, A. O. (2007). Young people's experiences using electric powered indoor–outdoor wheelchairs (EPIOCs): potential for enhancing users' development? *Disability and Rehabilitation*, 29(16), 1281-94

- Qualitative research article



Participants:

- 18 children & teenagers (13 males & 5 females)
- Aged 10 - 18 years
- Interviewed an average of 14.5 months after delivery of power wheelchair
- Diagnoses included muscular dystrophy, cerebral palsy & 'other'



Findings:

- More than half (10/18) reported accidents including tipping over, the chair running into people, banging into furniture and in one case, driving into a stationary car
- Road/surface (e.g. uneven terrain, potholes), curbs & weather conditions & faulty mechanics affect feelings of safety & security



Recommendations:

- There is a demonstrated need for additional and ongoing driving evaluation & training as young people mature



2) Berry, E. T., McLaurin, S. E., & Sparling, J. W. (1996). Parent/Caregiver Perspectives on the Use of Power Wheelchairs. *Pediatric Physical Therapy*, 8(4), 146-50

- Qualitative research article



Participants:

- 36 parents/caregivers interviewed
- Children aged 5 - 23 years with CP & meningocele
- Most children (57%) used wheelchairs both at school & at home



Findings & Recommendations:

- More education is needed around safety – many parents reported that the power wheelchair had tipped while the child was in it
- Power wheelchair training is necessary & needs to be addressed more by therapists
- Therapists have a responsibility to provide power wheelchair safety training



- 3) Home, A. M., Ham, R., & Nilsson, L. (2003). Provision of powered mobility equipment to young children: the Whizz-Kidz experience. *International Journal of Therapy & Rehabilitation*, 10(11), 511-18
- Qualitative research study



Participants:

- Retrospective survey of 61 participants
- Respondents' children < age 7 years at time of power mobility provision
- More than half were male (58%)
- Primarily CP (58%) & SMA (12%)
- Slightly more than half used power wheelchair at home & at school



Findings & Recommendations:

- 54% reported did not receive any training in use of the equipment
- Almost 1/3 of children experienced an accident some minor and some more serious:



Findings & Recommendations:

- trapping finger in furniture; knocking feet;
- the wheelchair denting furniture
- going over curb & falling on side causing bruising
- breaking a leg when no seat belt was worn when going down steep step;
- chair tipping forward but tray saving child;
- traveling up steep grassy bank & chair tips over backwards



4) Gudgeon, S., & Kirk, S. (2015). Living with a powered wheelchair: exploring children's and young people's experiences. *Disability and Rehabilitation: Assistive Technology*, 10(2), 118-25

- Qualitative Study



Participants:

- Semi-structured interviews with 9 children/youth
- 7-16 years
- Majority were male, with a diagnosis of:
 - CP
 - neuromuscular disorders or
 - brain tumor



Findings & Recommendations:

- Described injuring themselves, e.g., hitting door frame
- Described experiencing ongoing anxiety around control & use
- Experiencing accidents may reduce confidence for children, even minor accidents may cause negative feelings
- Anticipating harm may cause distress & fear
may limit even children who had used an EPIOC for some years



Sunny Hill OTs' Clinical Impressions and Recommendations for School-based Practice



SAFETY FIRST:

- The school-based therapist should be there for initial delivery/training
- The therapist should complete an environmental scan before initial training (e.g., of the school yard)
- Use & review the School-Aged Therapy - Safe Power Wheelchair Driving resource document with each child & their school staff



SAFETY FIRST:

- The child should always use a seat belt when in the power wheelchair
- When not driving, the wheelchair should always be turned off (either by the child or attendant) to minimize accidental activations.



Training is crucial, especially for new users and their school staff:

- Ensure all caregivers & staff have been trained in how to quickly shut off power & how to, in an emergency, manually disengage wheelchair (if on a level surface)
- Review use of safe transfer techniques to minimize falls, tips or accidentally turning on power
- Train child in safe operation including awareness of environment, others moving quickly & unpredictably



Ongoing training and monitoring is best practice:

- Identify who will be responsible for monitoring progress & ongoing safe use of power wheelchair
- Reassess if wheelchair is used in new environments and/or if skill level changes



New or *Replacement* wheelchairs:

- Ongoing monitoring is required following delivery (for example after 2 & then 4 weeks)
- Often equipment differences affect driving performance & can challenge safe & smooth wheelchair operation Examples:
 - wider or longer wheelchair base;
 - drive wheel configuration,
 - motors and other mechanical features,
 - access method, programming of electronics



Servicing & Maintenance:

- Ensure that equipment is maintained correctly, serviced regularly & regularly reviewed for correct fit & function



Key Messages

- Safety First
- Training is crucial, especially for new users & their school staff
- Ongoing training & monitoring is best practice
- Reassess & monitor after new, modified or replacement wheelchairs
- Servicing & maintenance critical for safety



Clinical Bottom Line

Although, in children & adolescents with major motor impairments, there is a lack of research evidence about school-based safety-focused power wheelchair driving interventions, the boarder evidence does support the need for this.



Clinical Bottom Line

- Therapists have a responsibility to provide power wheelchair safety training
- Power wheelchair training is critical & needs to be addressed more thoroughly by therapists
- There is a demonstrated need for ongoing driving evaluation & training, even with skilled drivers
- More education is needed around safety



Knowledge Products

For school-based therapists
development of:

- Multipage handout
- Accompanying checklist for therapists

.....will be eventually on the CDR



POWER WHEELCHAIR USE



GUIDELINES FOR SAFE-DRIVING AT SCHOOL

For new power wheelchair users, it is recommended that the school-based therapist set up a plan for initial training and safe use of the student's power wheelchair at school and then follow-up with ongoing training and monitoring of safe driving skills. The age and developmental level of the student as well as learning style and proficiency of using their power wheelchair will affect the level of supervision and training needed.

In general, adult supervision when using a power wheelchair should be provided to all young children driving (Casey, Paleg & Livingstone, 2013), those who are new to power mobility or who have complex conditions (Livingstone & Field, 2015). Age-appropriate supervision is important for safety (Dunaway et. al., 2013). Adults should set up and monitor the environment so that students can explore safely and learn by doing (Livingstone, 2010). Some children will always require supervision to ensure safety, but their use of a power wheelchair may allow spontaneous exploration in a safe environment to promote overall development (Livingstone and Paleg, 2014).

Below are general safe driving guidelines and recommendations that can be included in school-based therapy consultation and intervention with the goal of safe driving at school.

Initial Training and Use of Power Wheelchair at School:

It is recommended that the power wheelchair not be used at school until initial training can occur under the direction of the student's therapist. For some children, training will require only one or two sessions while for others on-going training over an extended period (e.g., months or years) may be needed.

The school-based therapist should arrange a date with parents/caregivers for power wheelchair delivery to the school. This will allow for equipment setup, an environmental scan/evaluation and initial training. This may take more than one session and would include:

- Assessment of student's wheelchair driving skills within the school setting, both indoors and outdoors as appropriate.
- Training school staff regarding safe use of the power wheelchair. This is crucial, especially for new power wheelchair users and their caregivers.



POWER WHEELCHAIR USE



CHECKLIST FOR SAFE DRIVING AT SCHOOL

Students Name: _____ Date(s): _____

Therapist Name: _____ Case Manager: _____

Use of all safe driving guidelines by the student and all trained school staff is important for the goal of safe and enjoyable power wheelchair driving at school.

Safe Power Mobility Use and Driving Guidelines: The following safety information was reviewed by the therapist with the student and (school staff) _____

(Therapist: Check ☒ those that apply):

1. Power Wheelchair Manual:

- ☐ A copy of the manual for school staff to read has either been provided or staff are aware that it is available online (open access).

2. School Environment:

- ☐ A brief description of the school environment, including areas of caution and how to proceed has been reviewed and will be included in written documentation to the school.

3. Level/Amount of Supervision: (Select ☒ one of the below)

- ☐ The student should only use the power wheelchair under the stand-by supervision of a trained adult/Education Assistants (EA).
- ☐ *Indoors* the student requires an adult to oversee and monitor general safe school use, although does not require constant or stand-by supervision. However *outdoors*, in the school yard, the student should only use the power wheelchair under the stand-by supervision of a trained adult/Education Assistants (EA).
- ☐ The student requires an adult to oversee and monitor general safe school use, although does not require constant or stand-by supervision.
- ☐ The student is fully independent and does not require adult supervision.

4. School Staff Training:

- ☐ Only those Education Assistants (EAs) that have been trained by the therapist should supervise the student.
- ☐ The school team needs to ensure new staff or any staff covering, even for a brief period (e.g., coffee break coverage), are properly trained.



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