

What evidence exists that the use of a powered wheelchair improves role performance in clients with a physical disability?

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Clinical Question

What evidence exists that the use of a powered wheelchair improves role performance in clients with a physical disability?

Clinical Scenario

Occupational therapists often prescribe powered wheelchair mobility to clients with physical disabilities affecting mobility in order to improve participation and satisfaction in chosen life roles. What evidence exists that the acquisition of mobility in a powered wheelchair improves occupational performance in people with physical disabilities.

Summary of Key Findings

5 studies were located which met the inclusion/exclusion criteria.

No Randomised Controlled Trials (RCTs) were found.

3 Single case design studies were located and appraised.

One study involved 2 children with physical and intellectual disabilities. Following the introduction of powered mobility this study reported an increase in the children's self initiated movement, however variable responses were recorded for interaction with others, and there were no measurable changes in the children's affect.

Another study involved 6 children with physical impairments only. This study reported positive changes in the children's self-initiated movements following powered mobility, but recorded variable changes in communications with people and objects in the environment.

The third study involved 8 adults who reported positive changes in occupational performance relating to community access, time efficiency and reduced need for physical assistance from carers, following the acquisition of powered mobility.

Each of the studies included very small heterogenous samples of convenience and no control groups. Therefore they should be considered as preliminary studies that do not constitute evidence from which clinical decision-making should be solely based.

Clinical Bottom Line

Provision of Powered Wheelchair Mobility may result in improved self initiated movements in children but appears to have variable effect on affect and interaction with objects and people in their environment. Improvements in role performance in adults with a physical disability have been reported.

Limitation of CAT

This summary of evidence has not undergone a process of peer review.

Methodology

Search Strategy

Using the levels of evidence as defined by NHMRC (2000), the search strategy aimed to locate the following study designs:

Level I	Systematic Reviews and Meta-analyses
Level II	Randomised Control Trials
Level III	Controlled trials, cohort or case-control analytic studies
Level IV	Case series
Level V	Expert opinion

A search was also conducted for clinical practice guidelines based on these levels of evidence.

Search Terms

Patient/Client:	cerebral palsy, physical disability
Intervention:	powered mobility, powered wheelchair mobility,
Comparison:	Nil
Outcome:	Occupational performance, role performance, self initiated behaviour, participation, occupation, role satisfaction, interaction, communication, self initiated interactions

Site/Resources Searched

- New Zealand Guidelines Group
- National Guidelines Clearinghouse
- Scottish Intercollegiate Guidelines Network (SIGN)
- UK Guidelines
- Healthbase
- National Association of Neurological OT's (NANOT)
- Motor Accident Authority of NSW
- Workcover NSW
- Cochrane Abstracts
- DARE
- PEDro – The Physiotherapy Evidence Database
- PubMed

Inclusion/Exclusion Criteria

Inclusion Criteria

- Studies including an outcome related to occupational performance. Eg. Self-initiated movement, interaction with environment.
- Studies involving the introduction of powered mobility devices to children or adults with disabilities affecting mobility.
- Studies published in English.

Exclusion Criteria

- Studies reporting on evaluation procedures/issues related to prescribing powered mobility devices.

Results

Results of Search

5 relevant studies were located and categorised as follows:

Table 1. Study designs of articles retrieved by search

Methodology of studies retrieved	Number Located	Source of Evidence
Clinical Practice Guidelines (Evidence Based)	0	N/A
Systematic Reviews or Meta – analyses	0	N/A
Randomised Control Trials	0	N/A
Controlled trials, cohort or case-control analytic studies	0	N/A
Case series: Post-test only, Pre-test/Post test	3	PubMed
Expert Opinion (literature reviews, consensus statements, descriptive studies, individual case studies.	2	Specialty Service reference collection.

Specific Results

The case series studies were critically appraised for this summary. The studies and appraisal findings are summarised in Tables 2,3 and 4.

Table 2. Description and Appraisal of Case Series by Buning et al (2001)

Objective of the Study:

To provide a pilot study on the transition from manual to powered mobility and its influence on occupational performance and feelings of competence, adaptability and self esteem.

Intervention Investigated:

- A convenience sample of 8 adult participants was included in the study.
- Retrospective study whereby participants were interviewed 6-12 months after receiving a powered wheelchair.
- Occupational Performance History Interview (OPHI), was used to measure changes in performance after moving to a powered mobility device.
- Psychological Impact of Assistive Device Scale (PIADS) was used to measure participant perceptions.

Primary Outcome Measures:

Measures were taken only once per client.

Measures Used:

1. The Occupational Performance History Interview (OPHI) was used to structure and rate each participant's interview responses. It is able to measure retrospective comparison of daily life before and after an event.

Questions related to:

- Activities of Daily Living
- Life roles
- Interests, values and goals
- Perception of ability
- Psychological impact

2. The Psychosocial Impact of Assistive Device Scale (PIADS) which is a self-report paper and pencil tool designed to measure psychosocial impact of assistive device.

Results:

OPHI: $p = .001$ $T = 0$ indicating a significant difference between past and present scores.
PIADS: the Spearman rank order correlations $r = .21$ (which measured the correlation between the present scores on the OPHI and the scores on the PIADS) This result may be due to the small data set.

Author Conclusions:

The OPHI and PIADS results support the use of Powered Mobility Devices but the sample size was small and the group was heterogenous.

The findings of the pilot study suggest that autonomy and self-sufficiency in occupational roles are enhanced by the use of a Powered Mobility Device. For example, not requiring a carer to push wheelchair on an outing or reducing the travel time in the workplace.

However, a larger more homogenous sample is now required to add further weight to these findings.

Appraisal Comments:

Validity (Methodology, Rigour, Selection, Biases)

Since the study was retrospective, there were no pre-intervention measures taken.

The sample size was too small to be able to make inferences about a population.

The sample was not randomly selected therefore allowing bias in the selection of subjects.

There was no control group with which to compare the results.

There was adequate detail provided in the methodology to be able to replicate this study.

Results

The accuracy and reliability of the findings may be reduced by the fact that the study was retrospective, with a small selected sample and no control measures.

A prospective study would allow for more accurate data collection prior to intervention.

A more homogenous sample will improve internal validity.

Table 2. Description and Appraisal of Case Series by Butler (1986)

Objective of the Study:

To investigate whether independent mobility in a powered wheelchair increased the incidence of self-initiated, exploratory behaviours through interaction with people and the environment.

Intervention Investigated:

A convenience sample included 6 children with physical disabilities and no intellectual impairment. The following single subject time series design was used.

A1 A2 A3 B' B1 B2 B3
A1 A2 A3 B' B1 B2 B3

A = before motorised wheelchair.

B' = wheelchair training to independent level of use.

B = with motorised wheelchair mobility.

Each subject was assessed on three occasions to establish baseline data (A1, A2, A3). Each subject then had a period of training in the use of the powered wheelchair (B'). Finally each subject was observed on three occasions while using the powered wheelchair and interaction and exploration behaviours were again recorded (B1, B2, B3). The subjects each began this process at different times.

Primary Outcome Measures:

The dependent variables measured included self-initiated:

- Physical interaction with objects
- Communications with caregiver
- Changes of location in space

Rates per minute were recorded

Results:

Changes of location in space – The group all recorded positive changes in rates per minute. This was statistically significant. $T = 3.57$, $P < 0.05$.

Interaction with objects and Communications did not record consistent changes for the group. The variability in the changes meant they were not statistically reliable.

Interaction with objects. $T = -0.86$, $P < 0.21$

Communications. $T = 0.80$, $P = 0.22$

Author Conclusions:

The study confirmed the authors hypothesis that powered mobility promotes opportunity for self-initiated changes in location.

They suggested that decreases in object interaction may be due to the wheelchair height limiting reach and access to objects in the environment, particularly for clients who have the ability to mobilise on the floor (by rolling or crawling) and therefore can explore objects within reach.

The decrease in communications was seen as a positive improvement for the verbal children who were very demanding and had appeared to become used to controlling their world using verbal interactions with others and now had other means for control. The other explanation provided for decreases in interaction was the possibility that achievement of locomotion temporarily depresses some interest in communication and objects in favour of movement through space.

Appraisal Comments:

Validity (Methodology, Rigour, Selection, Biases)

The sample size was too small to be able to make inferences about a population. The sample was not randomly selected therefore allowing bias in the selection of subjects. There was no control group with which to compare the results only baseline measures taken. There was adequate detail provided in the methodology to be able to replicate this study.

Results

Results failed to support the hypothesis that increased frequencies would be recorded in all aspects of self-initiated behaviour for all children. However results confirmed that powered mobility did promote opportunity for self-initiated changes in location. However there is no data to suggest that changes in location lead to increased interactions with people or objects on the environment or impact on occupational performance.

Qualitative measures taken including interviews and comments from parents/teachers seemed to support the hypothesis of improved psychosocial behaviours however this was not supported by the quantitative data.

Table 2. Description and Appraisal of Case Series by Deitz, et al. (2002)

Objective of the Study:

The purpose of this study was to explore the effects of a powered mobility riding toy on the participation behaviours of young children with complex developmental delays.

Intervention Investigated:

Convenience sample of 2 children with physical disabilities and developmental delay.

Single case withdrawal design.

ABAB

A without mobility device.

B = with mobility device.

Subjects were observed and measures were taken prior to using a powered wheelchair in the A phase. They were then observed with measured while using powered mobility in phase B. The powered wheelchair was then withdrawn for the second A phase, and re-instated for the second B phase.

Primary Outcome Measures:

The dependent variable measured included:

- Child-initiated movement
- Child- Initiated contact with others
- Affect (coded as positive, negative or neutral)

Video analysis was conducted. The number of movement occurrences was recorded per time interval (10 Mins).

Affect and contact interactions were recorded in intervals of 15 seconds throughout the ten-minute period.

Results:

Self-initiated movement - Both subjects recorded increases in movement in the powered mobility phases with immediate returns to baseline levels when the intervention was withdrawn. Since there

were only two subjects however, inferential analysis cannot be performed to indicate the significance of this change from a clinical perspective.

Interaction with others – Variable interactions were recorded over both intervention and baseline periods. Positive and negative adult and peer interactions were recorded. Results were graphed. No inferential statistics were performed. Affect results were presented as percentages and were also variable over both baseline and intervention phases.

Author Conclusions:

The study confirmed the authors hypothesis that powered mobility promotes opportunity for self-initiated changes in location. They suggested that movement learning had occurred as evidenced by the slightly increased levels of self-initiated movement in the adult initiations were variable and did not support the hypothesis that interactions would decrease with independent mobility.

Affect was variable and authors suggest that positive affect was transitory and soon replaced by goal-oriented concentration and attention to the environment, both of which may be more useful to measure in further research. They also suggest extending the research by using dependent variables related to developmental levels of play and self- assertiveness.

Appraisal Comments:

Validity (Methodology, Rigour, Selection, Biases)

The sample size was too small to be able to make inferences about a population.

The sample was not randomly selected therefore allowing bias in the selection of subjects.

The withdrawal design allowed for comparison of data with and without intervention.

Training effects and the time spent in the device may impact on the results.

Inter-rater reliability was tested.

Results

No inferential statistics were calculated and the sample included only two subjects, therefore, the results cannot really be generalised to a population.

Results confirmed the hypothesis that powered mobility promotes opportunity for self-initiated changes in location but did not confirm the hypothesis about effect on interaction and affect.

The authors were limited in the time frame for the study and may have collected more reliable information over a longer time period.

Articles critically appraised for this summary of evidence

Level III Evidence

1. Buning, M.E., Angelo, J.A., & Schmeler, M.R. (2001). Occupational performance and the transition to powered mobility: A pilot study. *The American Journal of Occupational Therapy*, 55(3), 339-344.
2. Butler, C. (1986). Effects of powered mobility on self-initiated behaviours of very young children with locomotor disability. *Developmental Medicine and Child Neurology*, 28, 325-332.
3. Deitz, J., Swinth, Y. & White, O. (2002). Powered mobility and preschoolers with complex developmental delays. *The American Journal of Occupational Therapy*, 56(1), 86-96.

Level IV Evidence

1. Paulsson, K. & Christoffersen, M. (1984). Psychosocial aspects on technical aids: How does independent mobility affect the psychosocial and intellectual development of children with physical disabilities? *Proceeding of the 2nd International Conference on Rehabilitation Engineering*, pp282-286.
2. Verberg, G. Snell, E., Pilkington, M. & Milner, M. (1984). Effects of powered mobility on young handicapped children and their families. *Proceeding of the 2nd International Conference on Rehabilitation Engineering*, pp172-173.