Influence of cognitive functions on powered mobility device use: Protocol of a systematic review

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INTRODUCTION

Individuals with mobility impairments can benefit from power mobility devices (PMD), i.e. scooters and powered wheelchairs [1]. PMD can improve independent mobility and social participation for individuals with mobility impairments [2]. According to a national survey in Canada, approximately 160 000 individuals use a PWD (42 400 users of powered wheelchair and 108 550 users of scooters). The prevalence is expected to increase as the population continues to age [3]. PMD can facilitate autonomy, independent living, and social participation in all aspects of life [4]. In addition, PMD use can enhance mobility confidence and mobility-related to participation [5-7]. Additionally, community-dwelling older adults reported satisfaction with well-being, self-esteem, dignity, and quality of life associated with using a PMD [2].

However, driving a PMD is a complex task that requires social and cognitive abilities [9] and interactions within the environment [10]. Therefore, PMD provision requires careful consideration of diagnosis and prognosis, motor cognitive and perceptual capacities, and environments [11]. In practice, occupational therapists often report feelings of uncertainty when considering safety, autonomy and risk [12]. Cognitive functioning is a major concern expressed by clinicians [12-14] and the clinical judgment plays a central role in the process of awarding a PMD [12]. However, it is unclear what level of cognition is required for safe PMD driving. Existing cognitive screening tools provide a global assessment of cognition, but do not consider specific domain (e.g., executive functioning, problem solving). Furthermore, existing PMD driving assessment tools focus predominantly on motor skills and performance-based outcomes, and not cognitive skills.

The Power Mobility Indoor Driving Assessment (PIDA), the Power Mobility Community Driving Assessment (PCDA), the WheelCon, the Wheelchair Skills Test (WST), the Power Mobility Road Test (PMRT) and the Functional Evaluation Rating Scale (FERS) represent existing validated tools that are commonly used to assess readiness for PMD [15]. However, despite the fact that it has been confirmed that PMD use is predicted by cognitive functions [16], all of those tools focus on evaluating wheeled mobility capacity or performance, to assess activity and participation of a wheelchair user [13] and do not consider how the cognitive functions may affect driving [15].

AIM AND OBJECTIVES

The proposed project aims to explore the influence of cognitive functions on PMD use. Specific objectives include: 1) identify existing approaches used to assess PMD use, and 2) classify cognitive functions that are considered within existing assessments.

METHODS

The present protocol will be registered within the PROSPERO database. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) statement will guide the completion and reporting on this systematic review.
Literature search

A university librarian was involved in the development of the search strategy. Appropriate terms and key words were based on MESH terms, existing studies on cognition and PMD use, and on the cognitive function chapter of the International Classification of Functioning, Disability and Health (ICF). This systematic review will search the MEDLINE, CINAHL, EMBASE, PsycINFO and Web of Science databases. The search strategy is based on the following concepts: 1) ‘PMD’, 2) ‘cognitive functions’ and related synonyms. In each database, the subject headings related to our two concepts will be used. The keywords to be used and writing rules (e.g., truncation, quotation marks, operators) will be adapted for each database. The resources will be searched independently by two authors (AP and MDL) to identify relevant articles. If the searches do not provide new/relevant articles using our strategy, we will consider discontinuing the search process in the following resources. All searches will be documented including terms used and the number of hits or articles obtained.

Eligibility criteria

The Population, Interventions, Comparator, Outcomes, and Study Designs (PICOS) structured approach [17] was used to frame inclusion and exclusion criteria. To be included studies must: 1) be scientific articles (including peer-reviewed and dissertation/theses), present original data and be written in English or French language; 2) include an assessment of cognition (i.e., quantitative or qualitative), and 3) include a sample of PMD users (inclusive of age and diagnoses) or individuals in contact with PMD users (eg., healthcare providers, caregiver). Studies not involving human subjects will be excluded. All studies following our criteria, as determined by two independent reviewers, will be included in the analysis. Disagreements on criteria assessment will be resolved by a referee.

Data management

Two persons will import all records from the databases in Endnote reference management software. Then references will be exported to ‘Covidence’ and duplicates will be removed automatically based on title of the references. Remaining duplicates will be deleted during the abstract/title screening process.

Screening and selection process

Titles and abstracts of all studies identified in the initial search will be screened for eligibility by two independent reviewers. The full text of all eligible studies will be retrieved and independently assessed for inclusion by two reviewers. Any disagreement in study eligibility will be resolved through discussion with a third reviewer. References of all considered articles will be hand-searched to identify any relevant report missed in the search strategy.

Data extraction

Data will be extracted independently by two or three reviewers into specifically designed extraction tables. Different tables will be created depending on the study design. All tables will include the following general categories: author; year of publication; country; study design; purpose of study; type of power mobility device (wheelchair or scooter); type of participant (user, clinician, caregiver, healthcare provider, government); participant demographics (sample size, sex, age, marital status, diagnoses); primary outcome: cognitive functions (classified using the ICF and including outcome tools when applicable); secondary outcome: PMD use (including outcome tools when applicable). Specific tables for randomised control design, pre-post design and intervention design will include categories such as: intervention, control group and outcomes measures. Discrepancies will be identified and resolved through discussion, with a third author when necessary. Missing data will be requested from study authors.

Critical appraisal

The quality assessment of every study will be completed independently by at least two authors. Firstly, the studies will be organised by study design and ordered from the highest level of evidence to the lowest level according Level of Evidence I to V [18]. The Mixed Methods Appraisal Tool version 2018 (MMAT), evaluating qualitative and quantitative designs, will be used to appraise the methodological quality of selected articles [19]. Scores will be ranged from 0% to 100%, in increments of 25%; a higher score indicating a better methodologic quality. Additionally, the ‘Methodology Checklist 1: Systematic Reviews and Meta-analyses’ will be used to evaluate Systematic Reviews and Meta-analyses.

Data analysis
A narrative synthesis, guided by the ICF, will describe the relationship between cognitive functions and PMD use. When possible, Pearson correlation coefficients between scores from cognitive functions and PMD use tools will be calculated when possible.

**DISCUSSION**

Results from this study will enhance understanding of the influence of cognitive functions on PMD use. In clinical practice, this systematic review could, for example, influence PMD provision for individuals with dual cognitive and mobility impairments. Realization of the proposed systematic review is the first part of a project that will lead to the development of a cognitive-enhanced PMD driving program through better assessment and training of cognitive capacity and ability to learn according to various cognitive functions (e.g., executive function, problem solving).

**REFERENCES**
