

Appendix A: Systematic search strategy and procedures

Research Question: Can wearable sensors be used to measure postural stability in people with Parkinson's disease?

Research Protocol:

Methods for Literature Search:

A targeted search was conducted on August 27, 2014 of relevant databases for articles that were published within the past 20 years (1994-2014) and reported using wearable sensors to assess elements of postural stability in people with Parkinson's disease (PD). Specifically, the databases searched were:

Pubmed
EMBASE
The Cochrane Library

Additionally, the bibliographies of the studies that met the inclusion criteria for this review were screened for relevant articles that may have been missed during the initial database searches. As potential papers were identified, they were added to an Endnote database to eliminate duplicate entries of research studies. The following outlines the complete combination of search terms that was used to search the titles and abstracts of potential papers for each of the three databases:

((((Parkinson's[Title/Abstract]) OR Parkinson[Title/Abstract])) AND
(((Walk[Title/Abstract]) OR Gait[Title/Abstract]) OR Balance[Title/Abstract]) OR
Stability[Title/Abstract])) AND (((((Acceleration[Title/Abstract]) OR
Accelerometer[Title/Abstract]) OR Gyroscope[Title/Abstract]) OR Inertial[Title/Abstract])
OR Sensor[Title/Abstract])

Strict Inclusion/Exclusion Criteria:

To be eligible for inclusion in the systematic review, papers were required to meet the following inclusion and exclusion criteria:

Inclusion Criteria: For inclusion, papers were required to; i) involve a PD population; ii) utilise a body-mounted wearable sensor; iii) present at least one outcome measure for balance or postural stability during standing or walking; iv) be written in English; v) include a control group or control condition (e.g. ON vs. OFF medication); or vi) be a full-text article (i.e. not a conference abstract, systematic review or meta-analysis).

Exclusion Criteria: Papers were excluded if they had; i) no control group or control condition; ii) a mixed neurological participant sample; iii), no blinding to intervention status (if applicable); or iv) a wearable sensor that was a pedometer.

Paper Review Process:

A minimum of 2 reviewers performed the initial screening of articles based on the title and abstract of the papers identified in the initial search and where discrepancies existed between the reviewers, they were discussed until a consensus was reached. The full-text of those papers that were considered potentially relevant following title and abstract screening were reviewed by 1 of the reviewers and papers that were eligible were subjected to quality assessment and data extraction. Where there were uncertainties about the relevance of a paper in the full-text review process, the second reviewer was asked to independently evaluate the study and the inclusion status of the paper was discussed until a final consensus was reached.

Quality Assessment:

The methodological quality of each included paper was assessed using a previously-developed checklist described by Downs & Black (1998). This quality assessment checklist uses 27 questions to assess the reporting of external validity, bias and other potentially confounding factors that may have existed due to the study design. Each variable on the checklist was valued at 1 point if the criterion was met, with a score of zero being awarded if the criterion was not reported. However, the criterion related to the reporting of power calculations was valued at 5 points due to its increased importance for sample size justification. The sum of the scores for each of these items was divided by the maximum possible score and multiplied by 100 to yield a percentage that provided an assessment of the manuscript's methodological quality. Manuscripts were classified as having either very low (<25%), low (<50%, but $\geq 25\%$), moderate (<75%, but $\geq 50\%$) or high ($\geq 75\%$) methodological quality.

Downs, S. H., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. Journal of epidemiology and community health, 52(6), 377-384.

Methods for Data Extraction and Analysis:

The initial step for this process involved a simple descriptive evaluation of each of the studies included in this review, which is presented in Table 1 of the manuscript. Furthermore, this table included a number of important pieces of information that were extracted from these studies and included:

- Demographics – Experimental groups, disease severity, disease duration
- Intervention – Description of intervention (if applicable)
- Sensor Details – Type and placement
- Postural Stability – Measures and modality of assessment
- Findings – Results of the study
- Quality Score – Details regarding the methodological quality of the study