PROTOCOL: Clinical applications of the Margin of Stability during walking – a qualitative systematic review.

Authors

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Review question

What types of pathological gait have been assessed using the Margin of Stability (MoS) during straight line walking? What are the main findings?

What methods are used to assess MoS? What are the results?

How is MoS data presented and analysed?

Databases to be searched

PubMed, Scopus, Elsevier, Web of Science, UCL Library Explore & Cochrane Library. Once a list of included items has been reached the reference lists will be searched for additional items that may have been missed. Theses will not be included but a search will be carried out for resulting publications. The reference list of included papers will be searched for additional papers.

Keywords

"Dynamic Stability Margin", "Margin of Stability", "Base of Support", "Centre of Mass", "Extrapolated Centre of Mass"

Limits applied to the search

Studies must be on adult human patients with a clinically diagnosed disorder (e.g. Parkinson's, limb amputation) where the MoS has been measured whilst walking in a straight line. Studies assessing turning, perturbations, gait termination, effect of a rehabilitation protocol, etc. on MoS in a clinical population will not be included. However, if a study such as these includes a baseline measurement of straight-line walking and reports results for that walk specifically then this can be included. Pregnancy, obesity and old age are not considered clinical problems, though papers that include a sub-population of frequent fallers in old age will be included. Articles in a language other than English must have been translated into English for inclusion. Studies will have been published after 2008 owing to the publication of Hof's seminal paper in that year introducing the extrapolated centre of mass and early MoS work..

Participants

The study populations will be human, and they will not be limited by sex, gender, ethnicity, socioeconomic status or geographical status.

Context

MoS measurements may be taken using any equipment (e.g. Motek, Vicon, etc.) or method (e.g. laboratory, wearable device, etc.).

Main Outcomes

Clinical populations, diseases and disorders with MoS investigated as a clinical outcome measure and why it is useful, the method and equipment used to measure the MoS, and how the results are presented and interpreted.

Data extraction

FW & CH will perform the literature search and initiate the study selection process such as removing duplicate items, or items with irrelevant titles and abstracts. FW & CH will assess the full text of remaining papers to assess inclusion/exclusion criteria of each. Disagreements on the final list on included papers will be decided by JL. All remaining articles will be included in the systematic review.

Information will be collected on study design, cohort information, method of measuring MoS, results and way they were presented. Studies with control participants will be acknowledged but the control population results will not be assessed in detail and will only be referred to in relation to the case populations results as comparison. Cohort information will include the disease/disorder/disability being investigated, age, number. Additional methodology of a tangent study that is not related to MoS, e.g. maximal isometric knee extension contractions, will not be described. If results of tangent studies are later compared to MoS they will be referred to in this manner only. MoS information will include the equipment used for data collection, the method of MoS calculation, the activities required of participants and conditions under which MoS was measured. The method for reporting results will be described and actual results will be noted. No specific data will be reported or compared for any items.

Exclusion criteria:

- Studies based on robots
- Studies based on animals
- Studies based on children
- Studies measuring MoS that don't include or report results for straight line walking (at baseline and prior to any intervention)
- Studies conducted solely on healthy volunteers.

Positive and negative results will be described in the table, but no specific numerical results will be reported. Results will be reported as statistically significant when $p<0.05$. Correlation will be reported as weak (0.31-0.5), moderate (0.51-0.8) or strong (0.81-1.0).

Risk of bias (quality) assessment

This review will briefly list positive and negative components seen across included papers, but a formal quantitative assessment of risk bias will not take place.

Contact details for further information

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Type and method of review

Systematic Review

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Conflict of interest

None known