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INPLASY

A protocol for a systematic review on the impact of walking on hippocampal volume

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ADMINISTRATIVE INFORMATION

Support - Cambridge Trust and Cambridge University Library.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 18 November 2024 and was last updated on 18 November 2024.

INTRODUCTION

Review question / Objective To explore the impact of walking on hippocampal volume.

Condition being studied Both healthy and/or impaired brains. This systematic review is not limited to a specific condition.

METHODS

Participant or population Human subjects (adults and elders) as reported in eligible studies for inclusion in the systematic review.

Intervention Walking in the form of a structured activity or as a free-living physical activity.

Comparator No comparison is requested yet this systematic review aims to evaluate the effectiveness of walking variability per se and not in comparison with other exercises. This systematic review does not include differences based on gait speed.

Study designs to be included Any original articles.

Eligibility criteria The Population, Intervention, Comparison, Outcome (PICO) framework was adopted to capture each key element required for the research aim (Schardt et al., 2007; Farrugia et al., 2010). Firstly, Population (P): Adult or elder adult human subjects with and without impairment. Secondly, Intervention (I): Walking in the form of a structured physical activity or free-living/lifestyle physical activity. Thirdly, Comparison (C): No comparison is needed but the aim is to explore the variability of walking parameters (i.e., step count, speed, environment) on the changes in hippocampus volume. Lastly, Outcome (O): Changes in hippocampus volume.

Information sources Original articles across three search databases: Scopus, PubMed, and Web of Science.

Main outcome(s) This systematic review synthesises the reviewed studies to reveal the optimal ranges and intensities of needed step count to expect a positive change in the hippocampal structure among healthy adults and elders. Specific populations, such as those with type 2 diabetes or multiple sclerosis, may require tailored walking ranges. The change in right or left hippocampal volumes depends on each region's response to spatial inputs or physical activity, but the subiculum is more responsive to lighter walking and brief exposure to natural environments due to the abundance of oxygen. This review highlights the potential of walking as a lifestyle intervention for maintaining and improving hippocampal neuroplasticity. It provides very critical insights useful for an informed environmental affordance for physical activity, and offers implications for interdisciplinary research interested in neurogenesis, cognitive reserve, and brain health.

Quality assessment / Risk of bias analysis the PEDro scale.

Strategy of data synthesis Narrative review.

Subgroup analysis A summary table is provided before data synthesis through narrative review.

Sensitivity analysis A summary table is provided before data synthesis through narrative review.A summary table is provided.

Language restriction English language only.

Country(ies) involved England, United Kingdom.

Keywords Hippocampus; walking; step count; exercise; physical activity; neuroplasticity; adult hippocampal neurogenesis; brain health.

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