PROSPERO International prospective register of systematic reviews

What is the capacity of the damaged brain to recover after a neurological injury in people with severe upper limb impairment: a systematic review

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Review question(s)
1. What are the brain biomarkers of motor recovery in people with severe upper limb impairment as a result of a neurological injury?

2. Do brain biomarkers of motor recovery differ early (6 months) in people with severe upper limb impairment as a result of a neurological injury?

3. Do brain biomarkers of motor recovery differ between people with stroke versus traumatic brain injury versus acquired brain impairment?

Searches
Electronic databases will be searched using a pre-determined search strategy. Databases will include MEDLINE, Ovid, CINAHL and EMBASE. Reference lists of eligible studies will be hand searched to identify potential studies that were not identified through the initial search process, along with citation tracking database, Web of Science.

Searches will be restricted to English only. In addition, we will complete a search to identify any relevant grey literature (e.g., conference proceedings and theses).

Types of study to be included
All study types will be included with the exception of reviews and single case studies.

Condition or domain being studied
Humans that have severe upper limb impairment as a result of stroke, traumatic brain injury (TBI) or acquired brain impairment (ABI)

Participants/ population
Populations included:

• Adult humans (19+ years) with stroke, TBI or ABI. Mixed samples are eligible if >50% of the sample has a neurological impairment of stroke, TBI or ABI.

• People who have experienced a severe upper limb impairment. Severe will be defined as per the original study. Mixed samples are eligible if >50% of the sample are severe or individual data is presented.

• People at any time period post stroke, TBI or ABI (i.e., acute, subacute or chronic).

• Populations will be excluded if they include >50% of people with progressive neurological injuries including Parkinson's disease or multiple sclerosis; or have tumours.

Intervention(s), exposure(s)

Included: No intervention delivered, non-pharmacological intervention (e.g., rehabilitation, behavioural, devices, complementary/alternative medicine

Excluded: Pharmacological intervention(s)

Comparator(s)/ control

No comparison group

Comparison to people with mild or moderate stroke, TBI or ABI;

Comparison to people without stroke, TBI or ABI.

Context

Research institutions, rehabilitation centres, acute/subacute hospitals

Outcome(s)

Primary outcomes

Primary outcomes will be measures that reflect possible brain recovery biomarkers after stroke, TBI or ABI. Brain recovery biomarkers for the purposes of this review will include functional magnetic resonance imaging (fMRI), resting state MRI, MRI, diffusion tensor imaging (DTI), electroencephalography (EEG), transcranial magnetic stimulation (TMS), magnetoencephalography (MEG), magnetic resonance spectroscopy (MRS).

Not applicable.

Secondary outcomes

Secondary outcomes will seek to explore the effect of time (i.e., less than 6-months vs. greater than 6-months); and condition on brain recovery (i.e., stroke vs. TBI vs. ABI).

Data extraction, (selection and coding)

1. Two authors (KH/JS) will screen eligibility based on title and abstract using predetermined criteria. Full text of the remaining studies will be retrieved. Reports from the same study population will be linked to ensure that the data from that population is only included once in the review and analysis.

2. Two authors (KH/JS) will review the eligibility of full text studies. Authors of studies may be contacted to collect any relevant data that is missing or to clarify details of the study to ensure appropriate study inclusion. If a disagreement regarding inclusion of a study into the review occurs it will be resolved by discussion and review of criteria among the two authors. If not resolved, a third reviewer (LB) will be involved to achieve a consensus. If still not resolved, a further two authors (SP/KW) will be asked to review the study. If no consensus is reached, it will be documented in the review.

3. Two authors (KH/JS/KL) using a predetermined data collection form will extract data. A third reviewer will cross-check a subsample (SP). The data extraction form will record information regarding:

a. Study (i.e., authors, date, location of study, definition of severe for study),

b. Participants (i.e., age, gender, characteristics of neurological injury),

c. Brain recovery biomarkers (i.e., measure of recovery, method measurement, timing of measurement, frequency of measurement)

d. Clinical recovery measures (i.e., measures of impairment, activity and participant, timing of measurement, frequency of measurement)

e. Intervention (i.e., no intervention, non-pharmacological interventions such as behavioural, rehabilitation, etc)

f. Comparator (i.e., no comparator, people with mild or moderate, people with no neurological injury),

g. Results (i.e., means, standard deviations, coefficients, p values, effect size)

h. Missing data to be followed up for a. to g., and

i. Miscellaneous data that is viewed to be of potential importance to this review.

If queries or discrepancies regarding data extraction occur, these will be resolved by including a third reviewer (SP) to achieve a consensus. If still not resolved, a further two authors (LB/KW/KL) will be asked to extract the data.

Risk of bias (quality) assessment
Risk of bias will not be assessed.

Strategy for data synthesis
Data will be entered into an excel spreadsheet and outcomes of interest will be described descriptively. Depending on the studies included in the review, an evaluation of the suitability for data pooling (e.g., meta-analysis) will be undertaken (KL).

Analysis of subgroups or subsets
Subgroup analysis (descriptive and pooling) may occur if sufficient data is available to explore the effect of time (i.e., less than 6-months vs. greater than 6-months); and condition on brain recovery (i.e., stroke vs. TBI vs. ABI).

Dissemination plans
Conferences, peer reviewed journal articles, educational sessions

Contact details for further information
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Organisational affiliation of the review
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Details of any existing review of the same topic by the same authors
Not applicable.

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Ongoing

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Stage of review at time of this submission	Started	Completed
Preliminary searches	Yes	No
Piloting of the study selection process	No	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No