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# Effectiveness and user experience of web-based interventions for increasing physical activity in people with multiple sclerosis

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## **Effectiveness and user experience of web-based interventions in increasing physical activity levels in people with Multiple Sclerosis: A comprehensive systematic review protocol**

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### **Review questions/ objectives**

The overall aim of this comprehensive systematic review is to explore the use of web-based interventions in increasing physical activity levels in people with a diagnosis of multiple sclerosis (MS).

The quantitative objectives are to identify:

- The clinical effectiveness of web-based interventions in enabling people with MS to increase their physical activity levels as evaluated by measures of physical activity.
- If (short or long term) web-based interventions enable people with MS to achieve the physical activity levels recommended in guidelines for adults with MS<sup>1</sup> whilst they are being used.
- If the use of web-based interventions enables people with MS to maintain recommended levels of physical activity after the intervention has ceased, at short and long term follow-up.

The qualitative objectives are to:

- Explore the experiences of people with MS using web-based interventions that aim to improve their physical activity levels.
- Gain further information regarding the enablers and barriers for people with MS of using web based interventions designed to increase physical activity.
- Identify whether, from the perspective of people with MS, web-based interventions help them to improve and sustain their physical activity levels over the short and long term.

## Background

Multiple Sclerosis is a chronic neurological condition that can result in a variety of impairments that may, progressively, impact negatively upon activity and participation levels.<sup>2</sup> It is reported that the MS population is less physically active than the general sedentary population.<sup>3,4</sup> This is thought to be due to a combination of factors which include: the direct effect of the impairments associated with MS such as weakness, fatigue and depression; a loss of confidence; and the resultant complications of general deconditioning and deterioration in function.<sup>4</sup>

It is well established that exercise therapy and physical activity promotion for people with MS have a positive role in managing and improving some symptoms such as weakness<sup>5</sup> and fatigue;<sup>6</sup> improving functional capacity and increasing activity levels,<sup>5</sup> consequently minimizing the complications and comorbidities associated with living a more sedentary lifestyle.<sup>2,7,8,9,10</sup> Furthermore, recent literature has suggested possible neuro-protective properties of exercise in people with MS.<sup>8</sup> In line with this there has been a move within clinical practice to both incorporate impairment focused exercise programmes, and facilitate engagement with increased levels of physical activity.<sup>11</sup> This approach also aligns with public health guidelines,<sup>12</sup> developed to promote physical activity participation in the general population at a sufficient level to achieve health benefits.

UK Department of Health Physical Activity Guidelines<sup>12</sup> recommend that adults should aim to complete at least 150 minutes of moderate intensity physical activity, in bouts of 10 minutes or more, each week. They suggest a way to approach this is to do 30 minutes, 5 days a week, at an intensity that, the individual can 'talk but not sing the words to a song' when exercising. Alternatively, comparable benefits are suggested through 75 minutes of vigorous intensity activity spread across the week or combinations of moderate and vigorous intensity activity. Alongside this, it is recommended that adults should undertake physical activity to improve muscle strength on at least two days a week.

National recommendations are helpful in the prescription, promotion and monitoring of physical activity, however, because they have been developed from evidence based on the general population, the question has been raised as to whether they are relevant for people with MS.<sup>1</sup> Latimer-Cheung<sup>1</sup> developed recommendations for physical activity for people with mild to moderate disability with MS, on the basis of a systematic review of the evidence. These guidelines recommend 30 minutes of moderate intensity ("can talk but not sing") activity twice a week and strength training involving major muscle groups twice a week. Such specific evidence-based advice regarding appropriate activity prescription and progression can help implementation of research findings into practice.

A constant challenge for both the individual and health care provider is ensuring that adequate levels of physical activity are sustained in the long term in order for the benefits achieved to be maintained.<sup>13</sup> In response to this, a number of studies have been undertaken to identify key issues which need to be considered in the design of complex interventions to promote adherence to physical activity.<sup>14,15,16</sup> Choice of activity, advice and support, and control over level of engagement are some of the factors reported, along with the ability to develop 'self-support'.<sup>15</sup> The low levels of physical activity in people with MS has also prompted work to identify the barriers to participation that people with MS experience. Fatigue, lack of time, the effort to attend and distance to access, rehabilitation venues are reported as specific issues.<sup>17,18</sup> In parallel, health services across the world face ever-increasing financial pressures, enforcing reconsideration of cost effective, evidence-based service delivery.

An approach that is being trialled in many areas of healthcare to address some of these issues is the use of web-based interventions; such interventions being those in which the internet is the mode of delivery. Reviews of web-based interventions to promote physical activity in the general population and conditions such as obesity, rheumatoid arthritis and diabetes have indicated promising results.<sup>19,20</sup> The meta-analysis by Davies et al.<sup>20</sup> included 34 studies, one of which was in the MS population.<sup>21</sup> A recent Cochrane review of telerehabilitation for persons with MS included nine randomized controlled trials evaluating a wide variety of complex interventions, including gaming interventions.<sup>22</sup>

With respect to physical activity, the review reports low level evidence for short term benefit in improving physical activity. A recent systematic review and meta-analysis of the effectiveness of behaviour change interventions to increase physical activity participation in people with MS included 19 studies, five of which reported on interventions delivered via the internet.<sup>23</sup> On subgroup analysis for these internet delivered interventions, a significant effect in increasing physical activity levels was reported. This review included only randomized and clinical controlled trials and those with a behavioural change component to their intervention, thereby limiting the generalizability of its conclusions.

In order to guide the development of web-based interventions, some qualitative work has been undertaken to explore the experiences of users of such interventions.<sup>24,25</sup> Paul et al incorporate user evaluation questionnaires (n=15) and telephone interviews (n=15) to describe the feasibility and acceptability of their physiotherapy web-based intervention, including suggested improvements to their website.<sup>24</sup> Casey et al used three focus groups (n=22) and 11 semi structured interviews to inform the development of a web-based resource to help people with MS increase their physical activity.<sup>25</sup> They used thematic analysis to develop their themes of 'Content' of information provided, 'Presentation' in a varied format for different abilities, 'Interactivity' to build a sense of community and 'Reach the audience' to ensure people know about the site and what is on it. Consultation with users of web-based interventions is likely to be instrumental in ensuring the on-going development of such tools to enable people with MS to increase physical activity levels in the long term.

This proposed systematic review will consider all studies that investigate the use of web-based interventions to increase physical activity in people with MS and explore the user experience of such interventions. It will seek to establish their effectiveness in increasing physical activity and whether levels are in line with MS specific guidance. Furthermore, this review will seek to establish the current level of understanding regarding the role of such interventions in maintaining adherence to physical activity in the long term, even following cessation of the intervention. These factors are important in order to inform clinical practice, and to identify any existing gaps in the evidence which require further investigation. A preliminary search of PROSPERO, The JBI Library and Cochrane databases has been performed to ensure originality of this proposed review.

## Definitions

In line with a recent review<sup>22</sup>, *short term* will be defined as 'up to three months', and *long term* as 'more than three months' from the start of the intervention. With regard to maintaining activity, *short term follow-up* is defined as 'up to three months', and *long term follow-up* as 'more than three months' after cessation of the intervention.

*Physical activity* will be defined as 'any bodily movement produced by skeletal muscles that requires energy expenditure'.<sup>26</sup> As such, interventions which contain all types of activity will be included, not only traditionally considered activity such as structured exercise and sport, but also lifestyle activity such as housework, gardening and employment. This contrasts with the definition of *exercise*, which is a form of physical activity that is planned, structured and repetitive, and is undertaken with the objective of improving or maintaining at least one aspect of physical fitness; that is strength, flexibility or aerobic endurance.<sup>27</sup>

*Web-based interventions* will be defined as interventions delivered via the internet. They may be exercise or lifestyle activity based and may also incorporate behaviour change or coaching elements.

## Inclusion criteria

### *Types of participants*

Studies that include adults over the age of 18 with a diagnosis of MS, regardless of MS type, time since diagnosis or level of disability.

### ***Types of intervention(s)/ phenomena of interest***

Studies that investigate the use of web-based interventions to increase physical activity will be considered. Interventions may be exercise or lifestyle activity based, and/ or incorporate a behavior change or coaching approach. Studies reporting an active comparator, usual care or wait list control and those without will be included. Interventions describing any regimen of frequency or intensity of delivery will be included. Studies that describe use of the Internet to deliver virtual assessments or gaming interventions (such as Wii or Xbox) will not be included in this review.

Qualitative studies that seek to explore experiences of using such interventions in any context will be included.

### ***Types of outcomes***

Studies will be considered that include measures of physical activity such as accelerometer, pedometer or global positioning system data or physical activity questionnaires such as the Godin leisure-time exercise questionnaire (GLTEQ), 7-day physical activity recall (7dPAR) or the International Activity Questionnaire (IPAQ.). Adherence/ compliance as measured, for example by recorded numbers of logins to web-based intervention or completion of activity diaries will also be included. The purpose of this review is not to evaluate the effectiveness of web-based interventions at the level of impairment, and hence outcomes such as weight loss or reduced blood pressure will not be considered.

### ***Types of studies***

The quantitative component of this review will consider both experimental and epidemiological study designs including randomized controlled trials, non-randomized controlled trials, quasi-experimental studies, before and after studies, prospective and retrospective cohort studies and case control studies.

The qualitative component will consider studies that focus on various qualitative designs, including, but not limited to phenomenology, grounded theory and ethnography.

### **Search strategy**

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilized in this review. An initial limited search of MEDLINE, AMED and CINAHL will be undertaken followed by an analysis of the text words contained in the title and abstract, and of the index terms used to describe articles. A second search using all identified keywords and index terms will then be undertaken across all included databases. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Studies published in English since 1990 will be considered for inclusion in this review. This date restriction is in place as the World Wide Web was invented in 1989, and therefore web-based interventions were not possible prior to this. Although preliminary searches have not identified published studies prior to 2000, the recent Cochrane review of telerehabilitation for persons with MS<sup>22</sup> used search dates predating 1990. Two independent reviewers will screen abstracts and full text articles for eligibility for inclusion, and any duplicates will be removed.

### **The databases to be searched include:**

MEDLINE (Ovid), EMBASE (Ovid), CINAHL (EBSCO), AMED (EBSCO), PEDro, PsychInfo, Web of Sciences, SCOPUS, The Cochrane Library, and The Cochrane Central Register of Controlled Trials (CENTRAL)

The search for unpublished studies will include hand searches of reference lists of all identified articles and searches using Google Scholar, Conference Papers Index and clinical trials registers via [www.controlled-trials.com](http://www.controlled-trials.com) and <http://clinicaltrials.gov>. Authors will then be contacted directly to request the full papers for inclusion, where these are available.

**Initial keywords to be used will be:**

- 1) Web-based OR internet-based OR www OR World Wide Web OR e-learning OR telerehabilitation OR eHealth
- 2) Multiple sclerosis OR MS OR neurological condition OR neurolog\*
- 3) Physical activity OR exercise OR physical fitness OR walking OR motor activity OR rehabilitation OR physiotherapy
- 4) Adherence OR compliance OR concordance OR sustain\*
- 5) Behaviour change OR behavio\* OR coaching

**Assessment of methodological quality**

Quantitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MAStARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer. Primary authors will be contacted as required to request clarification of methods where this is unclear to facilitate accurate assessment of methodological quality.

Qualitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Qualitative Assessment and Review Instrument (JBI-QARI) (Appendix I). Authors of primary studies will be contacted for missing information or to clarify unclear data. Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

**Data extraction**

Quantitative data will be extracted from papers included in the review using the standardized data extraction tool from JBI-MAStARI (Appendix II). The data, which will be extracted independently by two reviewers, will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

Qualitative data will be similarly extracted from papers included in the review, by two people independently, using the standardized data extraction tool from JBI-QARI (Appendix II). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

**Data synthesis**

Quantitative data will, where possible, be pooled in statistical meta-analysis using JBI-SUMARI, or equivalent e.g. RevMan. All results will be subject to double data entry. Effect sizes expressed as odds ratio (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. Heterogeneity will be assessed statistically using the standard Chi-square and also explored using subgroup analyses based on the different study designs included in this review. Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Qualitative research findings will, where possible, be pooled using JBI-QARI. This will involve the aggregation or synthesis of findings to generate a set of statements that represent that aggregation, through assembling the findings (Level 1 findings) rated according to their quality, and categorizing these findings on the basis of similarity in meaning (Level 2 findings). These categories are then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesized findings (Level 3 findings) that can be used as a basis for evidence-based practice. Where textual pooling is not possible the findings will be presented in narrative form.

### **Conflicts of interest**

There are no conflicts of interest for any of the authors.

### **Acknowledgements**

Joanna Triplett, Information Specialist, Plymouth University

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## Appendix I: Appraisal instruments

### MAStARI appraisal instrument

#### JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were participants blinded to treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was allocation to treatment groups concealed from the allocator?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were those assessing outcomes blind to the treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the control and treatment groups comparable at entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were groups treated identically other than for the named interventions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in the same way for all groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                       Exclude                       Seek further info.

Comments (Including reason for exclusion)

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### JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                   Exclude                   Seek further info.

Comments (Including reason for exclusion)

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**QARI appraisal instrument**

**JBI QARI Critical Appraisal Checklist for Interpretive & Critical Research**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:  Include  Exclude  Seek further info.

Comments (Including reason for exclusion)

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## Appendix II: Data extraction instruments

### MAStARI data extraction instrument

#### JBI Data Extraction Form for Experimental / Observational Studies

Reviewer ..... Date .....

Author ..... Year .....

Journal ..... Record Number .....

#### Study Method

RCT                       Quasi-RCT                       Longitudinal   
Retrospective                       Observational                       Other

#### Participants

Setting \_\_\_\_\_

Population \_\_\_\_\_

#### Sample size

Group A \_\_\_\_\_ Group B \_\_\_\_\_

#### Interventions

Intervention A \_\_\_\_\_

Intervention B \_\_\_\_\_

Authors Conclusions:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Reviewers Conclusions:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Study results**

**Dichotomous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

**Continuous data**

<b>Outcome</b>	<b>Intervention ( ) number / total number</b>	<b>Intervention ( ) number / total number</b>

**QARI data extraction instrument**

**JBI QARI Data Extraction Form for Interpretive  
& Critical Research**

Reviewer ..... Date .....

Author ..... Year .....

Journal ..... Record Number .....

**Study Description**

Methodology  
.....  
.....

Method  
.....  
.....

Phenomena of interest  
.....  
.....

Setting  
.....  
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Geographical  
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Cultural  
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Participants  
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Data analysis  
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Authors Conclusions  
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Comments  
.....  
.....

Complete

Yes

No

Findings	Illustration from Publication (page number)	Evidence		
		Unequivocal	Credible	Unsupported

Extraction of findings complete

Yes

No