

# Is environmental enrichment useful for stroke and other non-progressive brain injury? A Cochrane Review summary with commentary

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## Abstract.

**BACKGROUND:** Stroke and other traumatic brain injuries are the leading causes of global disability in adults. Environmental enrichment for neurological diseases is a relatively new concept within rehabilitation. These are interventions to enhance the level of somatic and social stimulation by providing an engaging environment.

**OBJECTIVE:** To assess the effects of environmental enrichment on well-being, functional recovery, activity levels and quality of life in people who have stroke or non-progressive brain injury.

**METHODS:** Multiple global databases were searched on 26 October 2020. Aim was to include only the randomized controlled trials that compared environmental enrichment with standard services.

**RESULTS:** A single RCT study with 53 participants with stroke was included. It compared the environmental enrichment (physical, cognitive and social activities such as reading material, board and card games, gaming technology, music, artwork, and computer with Internet) with standard services in an inpatient rehabilitation setting. The evidence was of very low quality and follow up was of 3 months only.

**CONCLUSIONS:** The current data are inconclusive and there is a need for well-designed large-scale trials to study the role of environmental enrichment in the functional recovery of neurological diseases.

Keywords: Environmental enrichment, rehabilitation, stroke, recent advances

The aim of this commentary is to discuss from a rehabilitation perspective the Cochrane Review “Environmental enrichment for stroke and other non-progressive brain injury” by Qin H, Reid I, Gorelik A, Ng L (Qin et al., 2021).<sup>a</sup>, published by Cochrane

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Reviews 2021, Issue 11, Art. No.: CD011879. DOI: 10.1002/14651858.CD011879.pub2 (See [www.cochranelibrary.com](http://www.cochranelibrary.com) for information). Cochrane Reviews are regularly updated as new evidence emerges and in response to feedback, and Cochrane Database of Systematic Reviews should be consulted for the most recent version of the review.

The views expressed in the summary with commentary are those of the Cochrane Corner authors (different than the original Cochrane Review authors) and do not represent the Cochrane Library or Wiley.

Rehabilitation with views of the review summary authors in the “implications for practice” section.

## 1. Background

Stroke and traumatic brain injuries are the leading cause of death and disability worldwide. They adversely affect the functional abilities, activities of daily living and restrict the societal participation of individuals. (Dye et al., 2015; Qin et al., 2021) Traditional rehabilitation services are generally provided or supervised by a trained rehabilitation professional. Environmental enrichment for stroke and brain injury rehabilitation is an emerging concept which aims to modify the environment to promote engagement in physical, social and cognitive activities (Nithianantharajah and Hannan 2006). It is not dependent on presence of a health care professional and exposure to such an environment encourages patient’s participation, with the aim of improving functional recovery. It is provided as an adjunct service and is not part of the formal rehabilitation services. The interventions may include computers with internet access, reading material, audio books, video games, board games, interactive recreational activities and music stations. Environmental enrichment is a possible alternative option for stimulating neural recovery by engaging patients in a variety of functional and cognitive activities. (Berges et al., 2012). Environmental enrichment has been recommended as a possible intervention for patients undergoing stroke rehabilitation in the 2016 American Heart Association/American Stroke Association Stroke Rehabilitation Guidelines. However, there is a need for further robust evidence for its effectiveness.

### **Environmental enrichment for stroke and other non-progressive brain injury**

(Helen Qin, Isabella Reid, Alexandra Gorelik, Louisa Ng 2021).

## 2. Objective

The aim of this Cochrane Review was to assess the effects of environmental enrichment on well-being, functional recovery, activity levels and quality of life in people who have stroke or non-progressive brain injury.

## 3. What was studied and methods

The population addressed in this review was adults of both genders with age  $\geq$  to 18 years having stroke or other acquired non-progressive brain damage. Authors included Randomized controlled trials (RCTs), comparing environmental enrichment with standard rehabilitation services. The primary outcomes of interest were psychological well-being and coping measured by Depression Anxiety Stress Scale-21 (DASS), Hospital Anxiety and Depression Scale (HADS), Rosenberg Self-Esteem Scale and Multidimensional Health Locus of Control (MHLC). Secondary outcomes included quality of life (QoL), physical functional improvement, communication and cognitive functional improvement, activity levels and adverse events. The review authors were interested in outcomes measured at four weeks (short term), between four weeks and 12 months (moderate term), and at 12 months (long term). Multiple global databases were searched on 20<sup>th</sup> Oct 2020, including Cochrane Central Register of Controlled Trials, Medline, Cumulative Index to Nursing and Allied Health Literature, Allied and Complementary Medicine, PsycINFO Ovid and other databases. Authors also attempted to identify further published, unpublished and ongoing trials by contacting the authors, tracking citations and hand searching the reference list.

## 4. Results

Only one randomized controlled trial with 53 participants was included. This study was conducted in a single-center inpatient rehabilitation setting in Australia. Participants were exposed to activities within the enriched environment in 10- minute blocks over two-hour sessions on weekdays only. Three assessments were done on admission, at discharge and at three months post-discharge.

Based on this single study, the review concludes that:

- Psychological well-being and coping: There were very low-quality evidence that at the time of discharge from hospital the Depression Anxiety and Stress Scale and multidimensional Health Locus of Control scores were significantly better in the environmental enrichment group as compared to the control group with the MD (95% CI) for DASS total was  $-24.1$  ( $-40.1$

to  $-7.2$ ) and MD (95% CI) of 3.7 (0.5 to 7.1) respectively. No such difference was detected on the Rosenberg Self-esteem Scale score with MD (95% CI) 2.1 ( $-0.4$  to 4.6). The effects were not sustained at 3- month follow up.

- Quality of life was assessed using Euro-Quality of life score. There was no significant difference between the two groups at the time of discharge (CI:  $-1.4$  to 14.7). The quality of evidence was very low. There was very low quality evidence that there was no significant difference in the communication and cognitive functional improvement between the two groups as assessed by Montreal Cognitive Assessment score with MD (95% CI) 2.1 (CI:  $-0.7$  to 4.9) and Functional Independent Measure (FIM) cognition subscale score with MD (95% CI) 1.2 (CI:  $-1.6$  to 4.1).
- There was very low-quality evidence that physical functional improvement as assessed through FIM motor total score was significantly better in the environmental enrichment group with MD (95% CI) of 6.7 (CI: 0.2 to 13.1). The effect was not sustained at 3- month follow.

Adverse events were not reported suggesting that the intervention was safe.

Conclusions: The authors concluded that insufficient results from a single randomized controlled trial should not be interpreted as proof of ineffectiveness of environmental enrichment. Further large scale adequately designed and powered trials should be conducted to evaluate the effectiveness and safety of environmental enrichment in stroke and other traumatic brain injury patients.

## 5. Implications for practice in neurorehabilitation

Due to improvements in the emergency and neurology services around the globe, more patients are surviving with long term neurological impairments which can be addressed by providing rehabilitation services. Although this review discusses role of environmental enrichment during in-patient stay, there is a need to enhance neuroplasticity once the patient has been discharged from the inpatient rehabilitation. Many patients following a stroke spent a large

proportion of the day in their bedroom in isolation and being inactive. Environmental enrichment is a promising adjunct to the traditional rehabilitation services which can potentially enhance the recovery process in patients with various forms of traumatic and non-traumatic brain injuries. Some options for environmental enrichment are not resource intensive and are readily available in most parts of the globe including the developing countries. They do not require a specialized medical setup or supervision of a trained rehabilitation professional and no side effects have been reported. However, some interventions are technology dependent. It is important that future research considers the cost and resource implications, and specifically explores the evidence for interventions that are readily available in developing countries. There is a need to conduct well designed large scale clinical trials on the role of environmental enrichment in a variety of settings and using different options.

## Conflict of interest

The authors declare no conflicts of interest.

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