Preceptorship on rehabilitation in multiple sclerosis

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Cognitive rehabilitation: Intervention

Emilio Portaccio

Department of NEUROFARBA - University of Florence

Memory Rehabilitation for people with multiple sclerosis
(Review)

das Nair R, Ferguson H, Stark DL, Lincoln NB

THE COCHRANE
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Neuropsychological rehabilitation for multiple sclerosis
(Review)

Rosti-Otajärvi EM, Hämäläinen PI

THE COCHRANE
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*"...**no evidence** to support the effectiveness of neuropsychological rehabilitation in MS...
...this conclusion has been arrived because of the **limited quality** of studies...
...**well-designed high quality studies are needed**"*

Review of published studies: Limitations

• Study design: non-randomized double blind controlled

• Small sample size: reduced power, analyses of sub-groups impossible

• Absence of clear-cut inclusion criteria: objectively documented cognitive deficits

• Absence of description of clinical features (sometimes sample characteristics and disease-variables are not reported)

• Short follow-up period: evaluation of short and long-term benefits needed

• Confounders: e.g. effects of medications

• Possible role of aspecific learning or practice effects

• Assessment of the functional impact on ADL

• Rehabilitative interventions not sufficiently described

Strategies to improve learning
Techniques borrowed from cognitive psychology

–**Modified story memory technique (MST)**

  – Use of *context* and *imagery* to improve learning of new materials

– **Self-generation effect**

  – The *generation effect* is the observation that items generated by subjects are remembered better than items simply presented

–**Spacing effect**

  – The *spacing effect* is the observation that learning trials spaced over time result in significantly better performance than if trials are "massed" (e.g. consecutive trials)

–**Testing effect**

  – The *testing effect* is the observation that testing (e.g. quiz) improves subsequent recall more than re-studying the material again

O' Brien, 2008; DeLuca 2011

Treating learning impairments improves memory performance in multiple sclerosis: a randomized clinical trial[†]

Nancy D Chiaravalloti*[,1,2], John DeLuca[1,2,3], Nancy B Moore[1] and Joseph H Ricker[1,2]

[1]Kessler Medical Rehabilitation Research and Education Corporation, 1199 Pleasant Valley Way, West Orange, NJ 07052, USA; [2]UMDNJ-New Jersey Medical School, Department of Physical Medicine and Rehabilitation, Newark, NJ, USA; [3]UMDNJ-New Jersey Medical School, Department of Neurosciences, Newark, NJ, USA

Table 1 Demographic and disease characteristics for all MS subjects by group (experimental versus control)

	15 pts	Mean (SD)	14 pts		t
	Experimental group		Control group		
Age (years)	45.14 (13.78)		46 (9.28)		−1.93
Education (years)	14.64 (2.71)		15.04 (2.82)		−3.76
Percent female	64%		57%		0.62 (χ^2)
Percent right handed	93%		86%		0.37 (χ^2)
Ambulation index	3.21 (2.81)		2.43 (2.62)		0.77
Duration of MS diagnosis	168.07 (101.24)		100.21 (60.12)		2.16*
WAIS-R vocabulary scaled score	10.64 (2.79)		10.64 (2.56)		0.00

*$P < 0.05$.

Generation Effect

- The <u>generation effect</u> is the observation that items generated by subjects are remembered better than items simply presented

- Robust effect in Healthy subjects

- Little work in Clinical samples

Self-Generation as a Means of Maximizing Learning in Multiple Sclerosis: An Application of the Generation Effect

Nancy D. Chiaravalloti, PhD, John DeLuca, PhD, ABPP

Spacing Effect

New learning in healthy individuals is significantly improved when trials:

- are **SPACED** or distributed over time

compared to

- **MASSED** or consecutive learning trials

Ebbinghaus, 1885/1994

A functional application of the spacing effect to improve learning and memory in persons with multiple sclerosis

To examine if **spaced** learning trials can improve recall and recognition of everyday life tasks compared to **massed** learning trials:

- Following a route on a map

- Remembering a paragraph from a newspaper

Govereover, 2009

Testing Effect

- Retention of information is much better when people practice retrieving the material (quizzing themselves) rather than restudying the material through massed restudy ("cramming") or spaced restudy (distributed learning)

- Powerful memory strategy among healthy persons

Retrieval practice is a robust memory aid for memory-impaired patients with MS

James F Sumowski[1,2], Victoria M Leavitt[1,2], Amanda Cohen[1], Jessica Paxton[1,2], Nancy D Chiaravalloti[1,2] and John DeLuca[1,2,3]

Research Paper

Examining the benefits of combining two learning strategies on recall of functional information in persons with multiple sclerosis

Yael Goverover[1,2], Michael Basso[3], Hali Wood[2],
Nancy Chiaravalloti[2,4] and John DeLuca[2,4]

ORIGINAL ARTICLE

Self-Generation to Improve Learning and Memory of Functional Activities in Persons With Multiple Sclerosis: Meal Preparation and Managing Finances

Yael Goverover, PhD, OT, Nancy Chiaravalloti, PhD, John DeLuca, PhD, ABPP

NEUROIMAGING AND REHABILITATION SPECIAL ISSUE

Increased functional connectivity within memory networks following memory rehabilitation in multiple sclerosis

Victoria M. Leavitt · Glenn R. Wylie · Peter A. Girgis ·
John DeLuca · Nancy D. Chiaravalloti

Modified Story Memory Technique

Computer-aided retraining of memory and attention in people with multiple sclerosis: a randomized, double-blind controlled trial

Alessandra Solari[a,*], Achille Motta[a], Laura Mendozzi[b], Eugenio Pucci[c], Marco Forni[d],
Gianluigi Mancardi[e], Carlo Pozzilli,[f]
on behalf of the CRIMS trial[1]

[a] Laboratory of Epidemiology, National Neurological Institute C. Besta, via Celoria 11, 20133 Milan, Italy
[b] Multiple Sclerosis Unit, Fondazione Don C. Gnocchi, Milan, Italy
[c] Neurology Department, Macerata Hospital, Macerata, Italy
[d] Neurology Clinic, University of Genoa, Genoa, Italy
[e] Fondazione Don C. Gnocchi, Marina di Massa, Italy
[f] Department of Neurological Sciences, University of Rome, Rome, Italy

RehaCom

Computerbased cognitive rehabilitation

- Computer-assisted therapy system for cognitive functions

- Modular system training:

    - Attention, concentration and vigilance

    - Memory and learning ability

    - Visuo-motor co-ordination

    - Reaction time and precision

    - Visuo-constructive ability

    - Solving problems and developing strategies

- Adaptation and adjustment to the patient's capabilities

- Feedback on the procedures and performances

Computer-aided retraining of memory and attention in people with multiple sclerosis: a randomized, double-blind controlled trial

Alessandra Solari[a,*], Achille Motta[a], Laura Mendozzi[b], Eugenio Pucci[c], Marco Forni[d], Gianluigi Mancardi[e], Carlo Pozzilli,[f]
on behalf of the CRIMS trial[1]

- Similar improvements of neuropsychological functioning in both groups

➡️ **Possible explanation**: non-specific effect by control intervention

Research Paper

Computer-assisted rehabilitation of attention in patients with multiple sclerosis: results of a randomized, double-blind trial

MP Amato[1], **B Goretti**[1], **RG Viterbo**[2], **E Portaccio**[1], **C Niccolai**[1], **B Hakiki**[1], **P Iaffaldano**[2] and **M Trojano**[2]

APT : Attention Process Training

- Specific rehabilitation

- A group of hierarchically organized tasks that exercise different components of attention as indicated by the clinical model of attention (Sohlberg and Mateer, 1987):

  - Sustained

  - Selective

  - Alternating

  - Divided

- The program tasks place increasing demands on complex attentional control and working memory systems (e.g. identification of target number or letter with the presence of distracter images and noises)

- Performed at home, twice a week for 3 months (session duration: 1 hour)

The "Cognitive Reserve" Hypothesis

- When disease challenges cerebral functioning, patients with **greater premorbid cerebral efficiency** can withstand more advanced disease before suffering cognitive impairment.

  Y. Stern et al., (2005), *Cereb. Cortex*

  Intellectual enrichment may be associated with greater cerebral efficiency, which provides a 'cognitive reserve' against cognitive impairment.

  Y. Stern, (2002), *J. Int. Neuropsych. Soc.*

ARTICLES

Cognitive reserve and cortical atrophy in multiple sclerosis
A longitudinal study

Maria Pia Amato, MD
Lorenzo Razzolini, MD
Benedetta Goretti, PhD
Maria Laura Stromillo, MD
Francesca Rossi, MD
Antonio Giorgio, MD
Bahia Hakiki, MD
Marta Giannini, MD
Luisa Pastò, MD
Emilio Portaccio, MD
Nicola De Stefano, MD

In cross-sectional analysis:
- CR predicted better performance on tasks of verbal learning and information processing speed, over and above cortical damage

In longitudinal analysis:
- Progression of cortical damage was the only predictor of progression of cognitive impairment

Brain reserve and cognitive reserve in multiple sclerosis

What you've got and how you use it

James F. Sumowski, PhD
Maria A. Rocca, MD
Victoria M. Leavitt, PhD
Gianna Riccitelli, PhD
Giancarlo Comi, MD
John DeLuca, PhD
Massimo Filippi, MD

ABSTRACT

Objective: We first tested the brain reserve (BR) hypothesis in multiple sclerosis (MS) by examining whether larger maximal lifetime brain volume (MLBV; determined by genetics) protects against disease-related cognitive impairment, and then investigated whether cognitive reserve (CR) gained through life experience (intellectually enriching leisure activities) protects against cognitive decline independently of MLBV (BR).

Methods: Sixty-two patients with MS (41 relapsing-remitting MS, 21 secondary progressive MS)

Cognitive Rehabilitation: State-of-the-Art

- Some evidence of effectiveness of:
    - <u>Rehabilitation of learning and memory</u> (exploiting learning techniques such as modified story memory technique, self-generation, spacing and testing effects)
    - <u>Rehabilitation of attention</u> (through computer-assisted retraining – RehaCom, Attention Process Training)

- Few studies, several methodological limitations
    - Study design (non randomized double-blind controlled)
    - Small sample size
    - Absence of clear-cut inclusion criteria
    - Poor description of clinical characteristics
    - Short follow-up period
    - Confounders and practice effects not addressed
    - Impact on everyday life not addressed

Cognitive Rehabilitation: State-of-the-Art

- No one shared methodology or evaluation model
  - What should be target
  - What form training should take
  - Length and spacing of the sessions
  - What level or profile of impairment is best addressed

  Some suggestions:

  - Specific rehab better than non-specific: targeting specific functions

  - Interventions based on robust psychological constructs better

  - Intensive training better

  - Potentiation of cognitive reserve