Cognitive training in MCI and SCI: Impact on cognition, strategy use and virtual reality measures of real-life cognition

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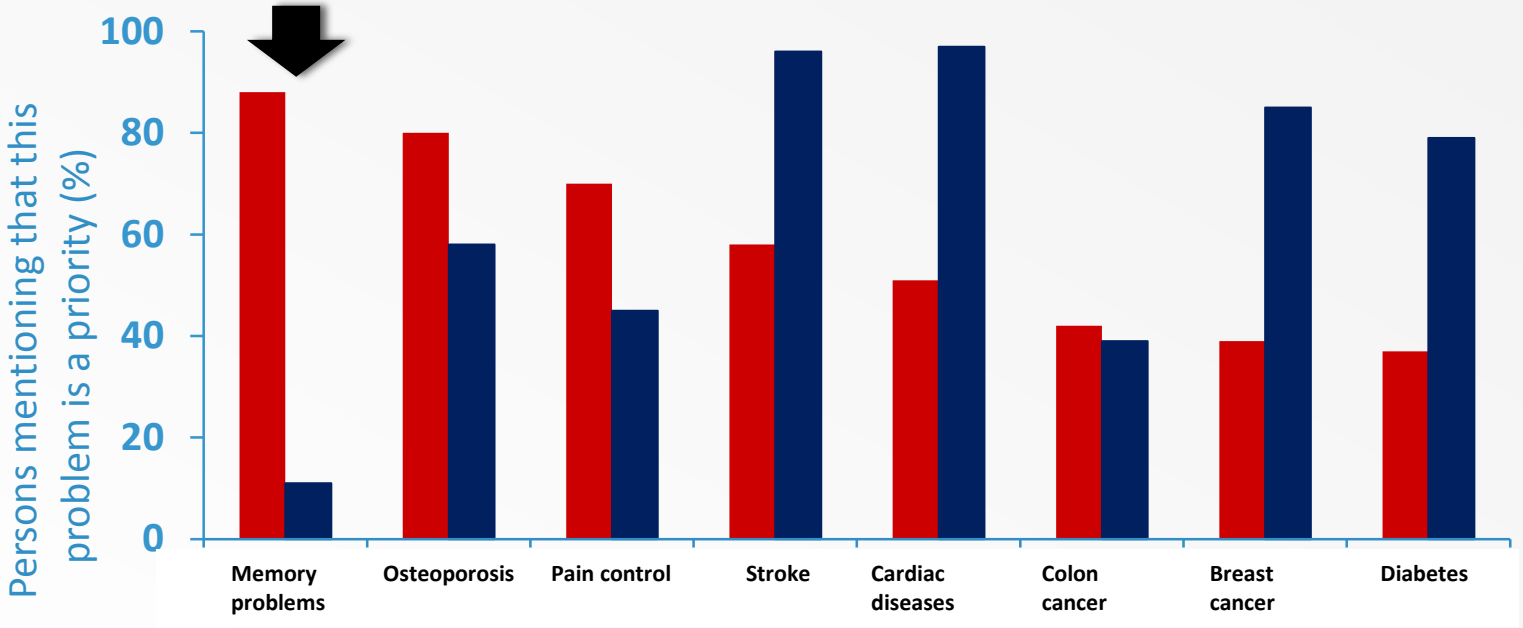
Memory is the top health priority for older adults and the one least addressed!



Older women's health priorities and perceptions of care delivery: results of the WOW health survey

Cara Tannenbaum, Nancy Mayo, Francine Ducharme

N= 2161 older canadian women

Can I do something to protect my brain from the effects of the disease?

There are things that you can do

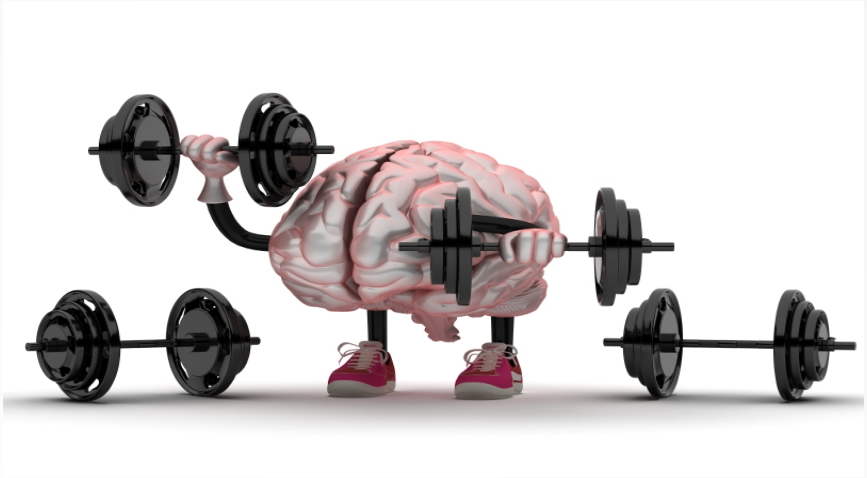
- Be physically active
- Keep a well balanced heatlhy diet
- Stop smoking
- Control vascular risk factors (hypertension, diabetes, obesity)
- Sleep well
- Keep your brain active

There are things that you can do

- Be physically active
- Keep a well balanced heatlhy diet
- Stop smoking
- Control vascular risk factors (hypertension, diabetes, obesity)
- Sleep well
- **Be cognitively active**

Participating in cognitively stimulating activities reduces by **60%** the risk of developing Alzheimer's disease

- Early life education
- Cognitively stimulating jobs
- Cognitively stimulating leisure activities
  - E.g.: cross-words puzzles, camera club, strategy games, museum, debates, learning another language or learning music…



A stimulating lifestyle allows you to build your ***cognitive reserve***

How does this protect the brain?




COGNITIVELY STIMULATING ACTIVITIES across the lifespan

RESISTANCE
Less pathologies in the brain

RESILIENCE
Pathologies are present but their effects are compensated by more efficient or active brain networks

COGNITIVE RESERVE

Better cognition

Can we build our cognitive reserve at an older age with cognitive training?

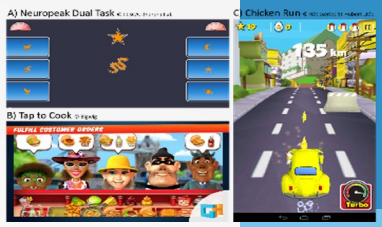
- Cognitive training might also help daily life by providing strategies that one can use to better perform cognitively demanding activities.

Different types of training

(Willis et Belleville, 2016)

- **Therapist-based strategy training :** teaching of new/more efficient ways to complete tasks (e.g.: *ACTIVE*, *MÉMO*)

- **Computerized training**: **Serious videogames** experimental (e.g.: Neuropeak; priority training) or **commercial plateforms** (e.g: Brain HQ, Happy Neuron), **casual videogames** (e.g. Super Mario 64; Crazy taxi)



- **Community-based activities** : **Volunteering** or **intergenerational activities** (e.g.: Experience corps), **new cognitively stimulating leisures** – music, second language, digital photography (e.g.: Synapse; Engage)

The MEMO program

- Focus on **memory** : main complaint.
- Provides a **tool-box** of **memory strategies**
- Includes **multi-tasking training** to improve memory in real-life distracting conditions.
- **Therapist-based small group** (4-5 persons)
- Designed to promote **self-confidence**
- Exercices to practice **use of strategy in everyday life**

Gilbert, Fontaine & Belleville (2007) MEMO : A memory training program for older adults

Pay attention

Focus your attention:
slow down, stop, be aware of the present
(stop and find a cue to where I parked the car)

Reduce « irrelevant noise » or visual distractors
(television, radio)

Try to reduce multitasking
if you have to, focus on the most important task

Take pauses when doing demanding tasks

Encode with depth

Relate to things you already know

(the first time I came to Miami!)

Group items

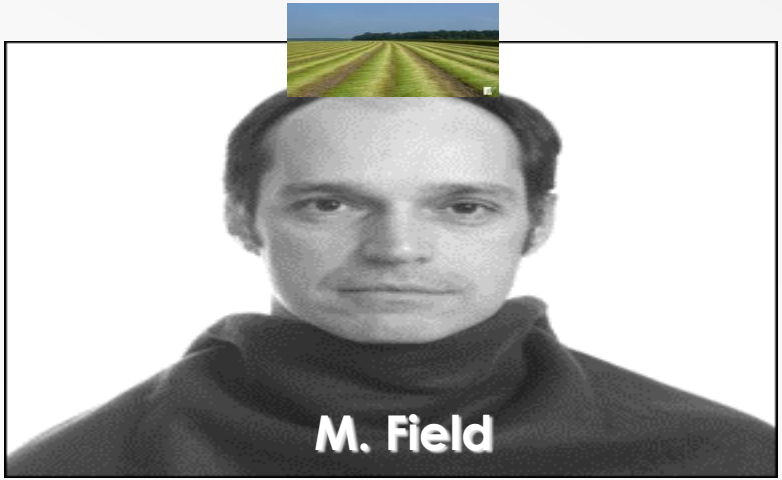
organize them in meaningful units

Use dual coding

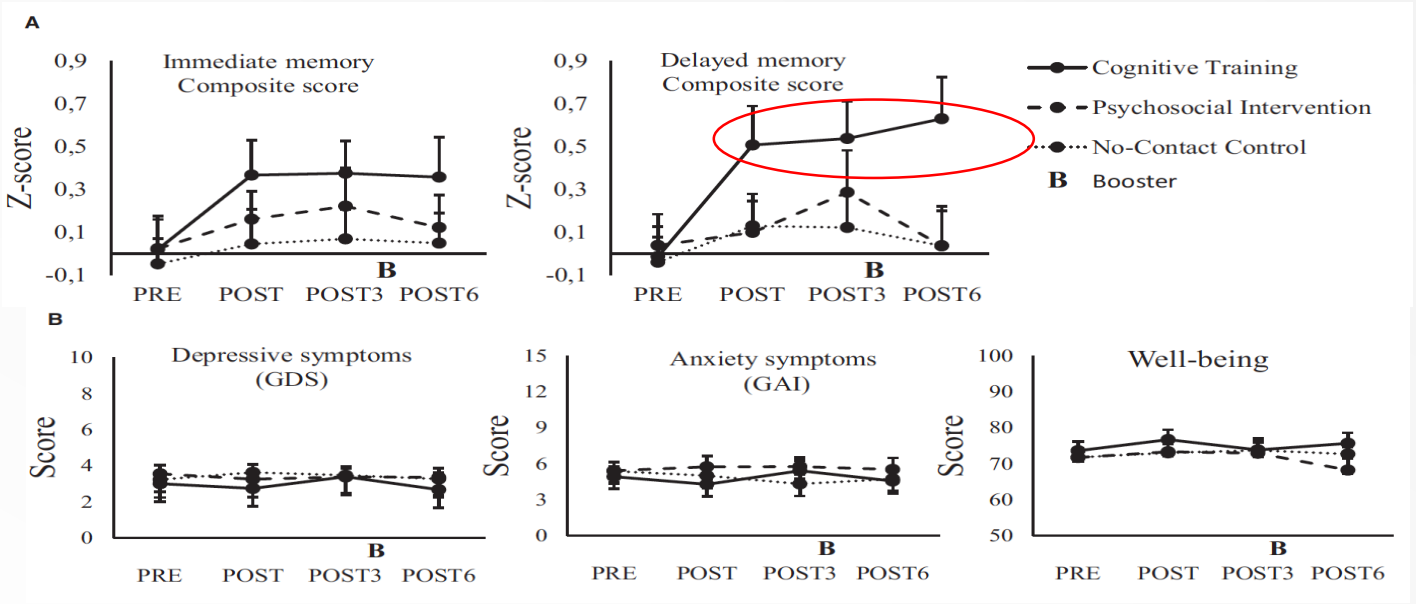
Visualize, speak out loud instructions in your own words

Make funny associations

Learn, practice and use memory strategies



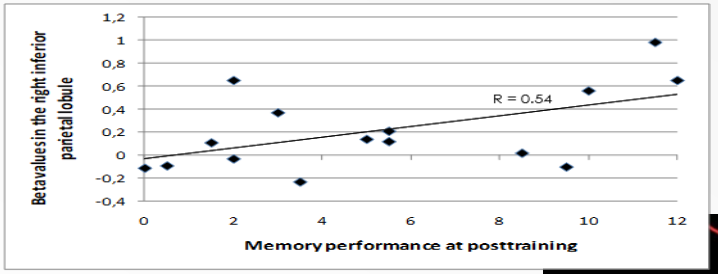
Efficacy, durability and specificity



Modified ITT analyses; Mixed linear model adjusted for sex, educations and age;
Group x Time interaction; $P<0.01$, for delayed memory composite

Mean Age: 72.3 ans; Mean Education: 14.6 years of age; 53.4% women

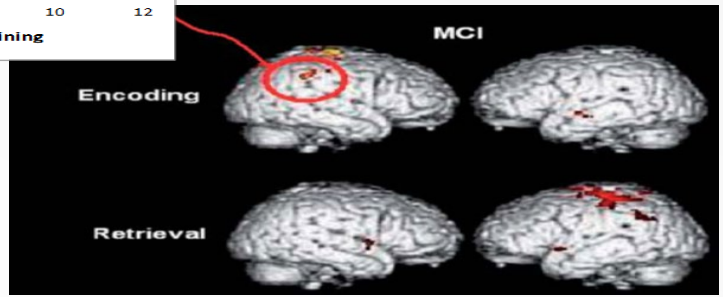
Increased brain activation in regions related to the learned strategies



doi:10.1093/brain/awr037 Brain 2011: Page 1 of 12 | 1
BRAIN
A JOURNAL OF NEUROLOGY

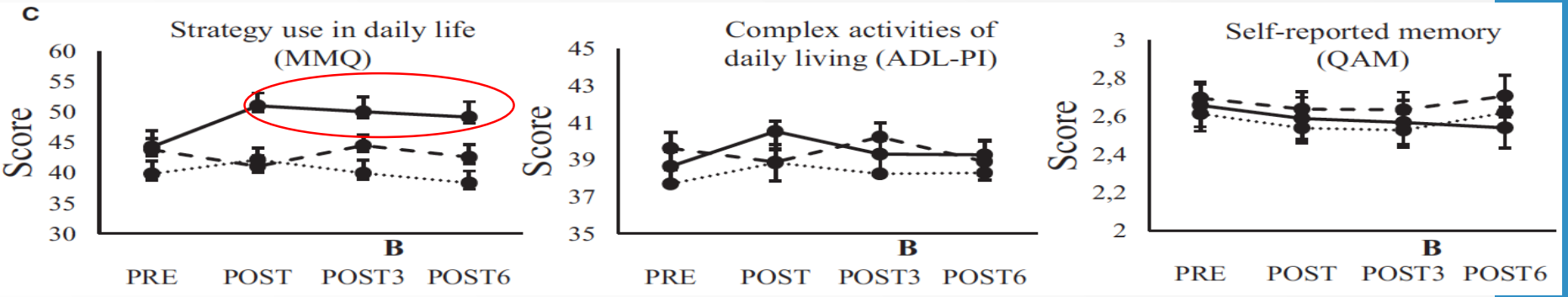
Training-related brain plasticity in subjects at risk of developing Alzheimer's disease

Sylvie Belleville,[1] Francis Clément,[1] Samira Mellah,[1] Brigitte Gilbert,[2] Francine Fontaine[2] and Serge Gauthier[3]



Post-Pre activation

Effect on transfer ? they more often use strategies … but do not show improvement on on self-reported complex activities

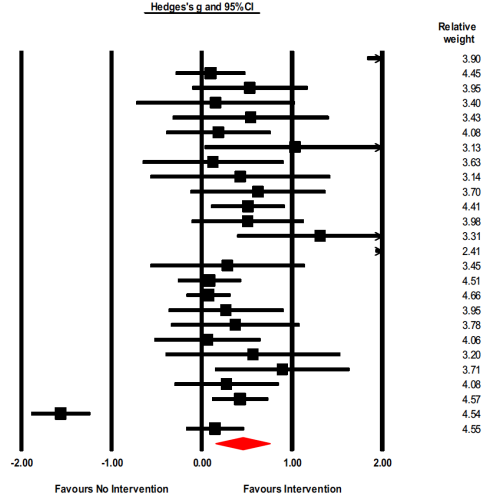


Modified ITT analysis with mixed linear model adjusted for sex, age and education; Group x Time interaction; P<0.01 for strategy use (MMQ)

Strategy based cognitive training improves cognition in persons with MCI and the effect is durable

Effect on all outcome measures

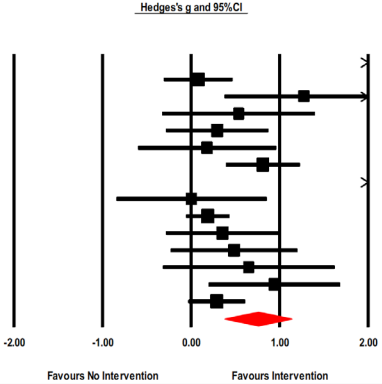
Study name	Outcome	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Relative weight
Balietti et al. (2016)	Combined	2.495	0.335	0.112	1.839	3.151	7.452	0.000	3.90
Barban et al. (2016)	Combined	0.097	0.195	0.038	-0.285	0.478	0.497	0.619	4.45
Barnes et al. (2009)	Combined	0.533	0.323	0.104	-0.101	1.166	1.648	0.099	3.95
Buschert et al. (2011)	Combined	0.154	0.445	0.198	-0.719	1.027	0.345	0.730	3.40
Carretti et al. (2013)	Combined	0.542	0.439	0.193	-0.318	1.402	1.235	0.217	3.43
Fiatarone Singh et al. (2014)	Combined	0.184	0.292	0.085	-0.388	0.756	0.631	0.528	4.08
Finn & McDonald (2011)	Combined	1.033	0.507	0.257	0.039	2.027	2.037	0.042	3.13
Finn & McDonald (2015)	Combined	0.125	0.396	0.157	-0.650	0.901	0.316	0.752	3.63
Forster et al. (2011)	Combined	0.427	0.505	0.255	-0.564	1.417	0.844	0.399	3.14
Gagnon et al. (2012)	Combined	0.623	0.378	0.143	-0.118	1.364	1.649	0.099	3.70
Giuli et al. (2016)	Combined	0.511	0.206	0.042	0.108	0.915	2.485	0.013	4.41
Greenaway et al. (2012)	Combined	0.508	0.315	0.099	-0.109	1.126	1.613	0.107	3.98
Hampstead et al. (2012)	Memory - Visual - Percent Change	1.312	0.466	0.217	0.399	2.225	2.817	0.005	3.31
Herrera et al. (2012)	Combined	3.293	0.694	0.481	1.934	4.652	4.748	0.000	2.41
Jean et al. 2010a	Combined	0.285	0.434	0.188	-0.565	1.136	0.657	0.511	3.45
Jeong et al. (2016)	Combined	0.084	0.176	0.031	-0.261	0.428	0.476	0.634	4.51
Lam et al. (2015)	Combined	0.074	0.120	0.014	-0.162	0.310	0.614	0.539	4.66
Mowszowski et al. (2014)	Combined	0.268	0.322	0.104	-0.364	0.900	0.832	0.406	3.95
Olchik et al. (2013)	Combined	0.371	0.360	0.130	-0.334	1.077	1.031	0.302	3.78
Polito et al. (2015)	Combined	0.063	0.296	0.088	-0.517	0.644	0.213	0.831	4.06
Rapp et al. (2002)	Combined	0.566	0.491	0.241	-0.396	1.528	1.154	0.249	3.20
Rojas et al. (2013)	Combined	0.894	0.376	0.142	0.156	1.631	2.375	0.018	3.71
Schmitter-Edgecombe et al. (2014)	Combined	0.275	0.291	0.085	-0.296	0.846	0.943	0.346	4.08
Tsolaki et al. (2011)	Combined	0.424	0.154	0.024	0.122	0.727	2.748	0.006	4.57
Valdes et al. (2012)	Speed - SOPT	-1.565	0.164	0.027	-1.887	-1.243	-9.528	0.000	4.54
Vidovich et al. (2015)	Combined	0.146	0.161	0.026	-0.169	0.461	0.910	0.363	4.55
		0.454	0.152	0.023	0.156	0.753	2.983	0.003	



Other types of interventions have encouraging results as well

Effect on memory measures

Study name	Outcome	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value	Relative weight
Balietti et al. (2016)	Combined	2.824	0.336	0.113	2.165	3.483	8.399	0.000	6.87
Barban et al. (2016)	Memory - Verbal - RAVLT (Delay)	0.083	0.195	0.038	-0.299	0.464	0.425	0.671	8.00
Buschert et al. (2011)	Memory - Story Delay (RBANS)	1.276	0.455	0.207	0.385	2.167	2.806	0.005	5.85
Carretti et al. (2013)	Memory - List Delay	0.538	0.437	0.191	-0.318	1.394	1.232	0.218	6.00
Fiatarone Singh et al. (2014)	Memory - Verbal - LM II (Delay)	0.296	0.292	0.085	-0.276	0.868	1.014	0.310	7.25
Finn & McDonald (2015)	Memory - Verbal - VPA-II	0.182	0.395	0.156	-0.592	0.956	0.461	0.645	6.36
Giuli et al. (2016)	Memory - Verbal - Word Pairs	0.812	0.210	0.044	0.401	1.223	3.873	0.000	7.89
Herrera et al. (2012)	Combined	4.644	0.811	0.658	3.053	6.234	5.723	0.000	3.40
Jean et al. (2010)	Memory - CVLT-II Long Delay	0.005	0.430	0.185	-0.839	0.849	0.012	0.991	6.05
Lam et al. (2015)	Memory - List Learning (Delayed Recall)	0.190	0.120	0.015	-0.046	0.426	1.577	0.115	8.42
Mowszowski et al. (2014)	Memory - Verbal - RAVLT (Delay)	0.356	0.323	0.104	-0.276	0.989	1.105	0.269	6.99
Olchik et al. (2013)	Memory - Verbal - RAVLT (Delay)	0.487	0.362	0.131	-0.221	1.196	1.347	0.178	6.65
Rapp et al. (2002)	Combined	0.654	0.491	0.241	-0.309	1.617	1.331	0.183	5.54
Rojas et al. (2013)	Memory - List Delay	0.944	0.376	0.141	0.208	1.680	2.513	0.012	6.53
Vidovich et al. (2015)	Memory - CVLT-II Long Delay	0.291	0.161	0.026	-0.024	0.606	1.811	0.070	8.21
		0.758	0.192	0.037	0.382	1.133	3.956	0.000	



Neuropsychol Rev (2017) 27:440–484
https://doi.org/10.1007/s11065-017-9363-3

REVIEW

The Efficacy of Cognitive Intervention in Mild Cognitive Impairment (MCI): a Meta-Analysis of Outcomes on Neuropsychological Measures

Dale S. Sherman[1,2] · Justin Mauser[3] · Miriam Nuno[4] · Dean Sherzai[5]

Virtual reality

Can be used to design a **diversity of multisensorial environments and scenarios**

Real and virtual appartement

Corriveau-Lecavalier, Ouellet & Belleville, 2017; Ouellet, Boller, Corriveau-Lecavalier, Cloutier & Belleville, 2018; Bier & Belleville, 2017, Boujut & Belleville

How to choose your healthy brain program?

Is this program validated with empirical finding? What are the claims? What are my goals? Are they realistic?

Do I like this type of activities or format?

Do not forget other components: physical activities, vascular risk factors, healthy diet

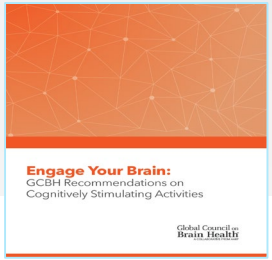
Triple activity scores
(triple word scores in SCRABBLE)

Activities that stimulate more than one domain

(cognition, physical activities, social network, healthy diet)

Tai Chi; Learning tango; Classes to learn new healthy recipes; Volunteering.

Thank you for your attention and take care of your brain health



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CRSNG NSERC

Chaires de recherche du Canada Canada Research Chairs

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