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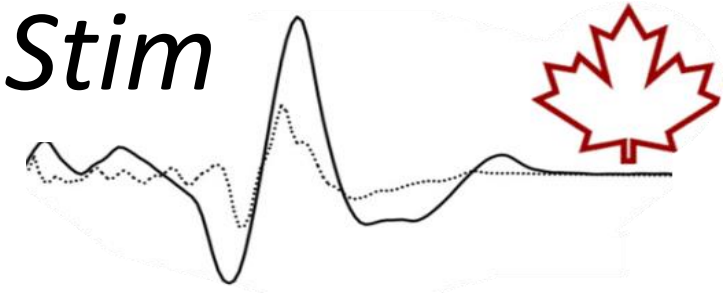
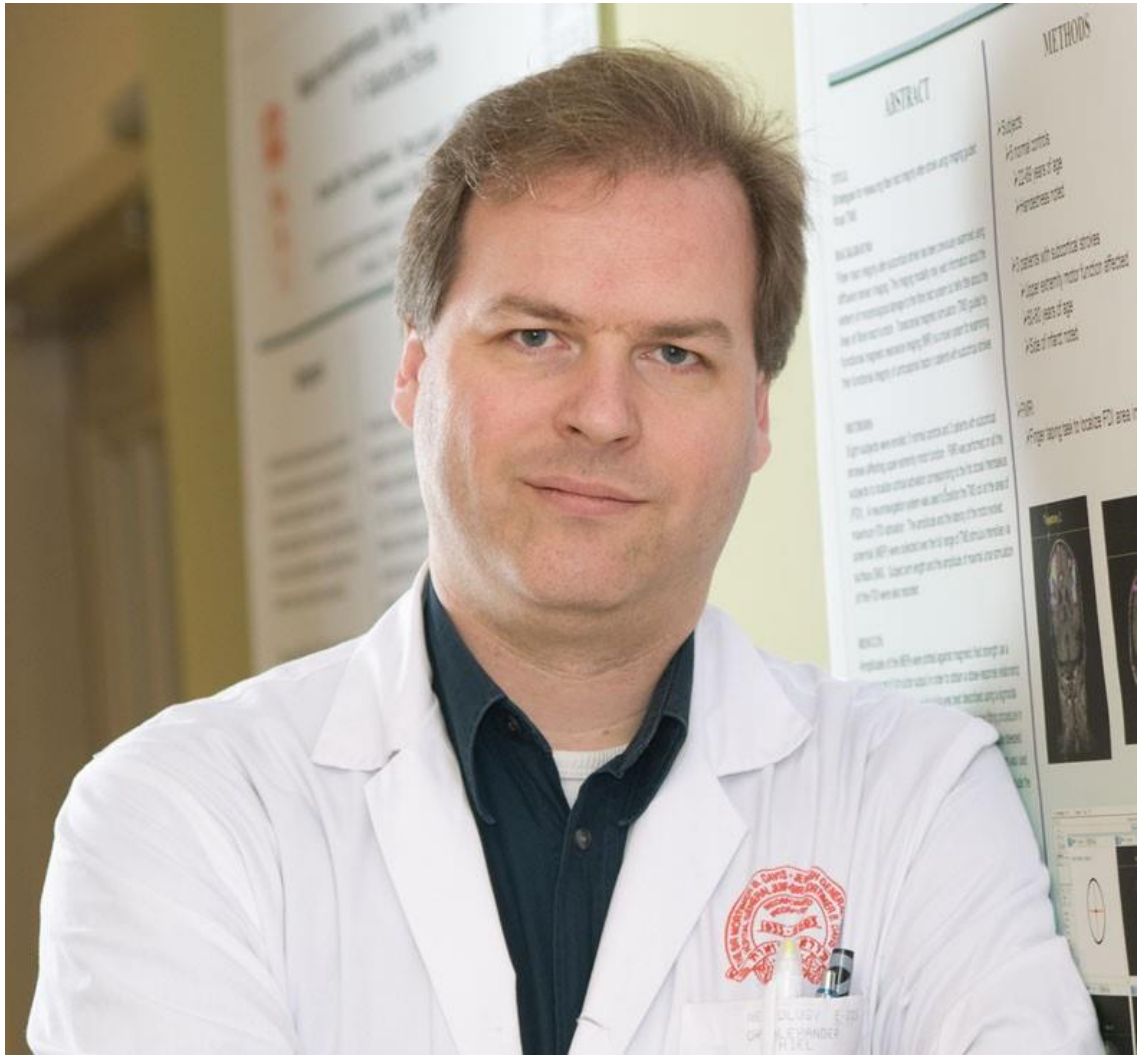


Nouveautés en réadaptation, la stimulation transcrânienne

Dr. Alexander Thiel

McGill University, Montréal, Canada



Dr Alexander Thiel, M.D.

Déclaration des conflits d'intérêt réels ou potentiels

Conférencier: Dr Alexander Thiel

En relation ou non avec le contenu de cette activité, j'ai eu, au cours des deux dernières années, une affiliation ou des intérêts financiers ou de tout ordre avec une société à but lucratif, ou j'estime que je dois divulguer à l'auditoire un intérêt ou une orientation particulière, non pécuniaire.

Nom de l'organisme	**Type d'affiliation** (subvention, honoraires, conférenciers, actionnariat majoritaire, autres)	**Date**
Fondation des maladies du cœur et de l'AVC	Subvention de recherche	2016-2019
Instituts de recherche en santé du Canada (CIHR)	Subvention de recherche	2013-2019 2020-2023
Consortium Neurovasculaire Canadien	Subvention de recherche	2016-2019

Objectifs

La stimulation transcrânienne est efficace pour

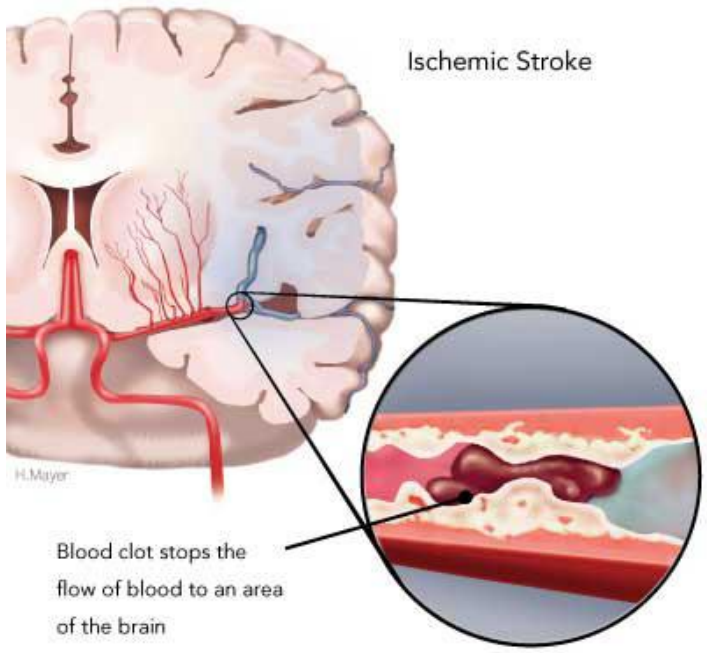
1) Quel deficit (Que traitons-nous?)
2) Á quelle point de temps après l'AVC (Quand traitons-nous ?)
3) Avec quel paradigme de stimmulation (Comment traitons-nous ?)

Donner des réponses au base de preuves d'essais cliniques

Que traitons-nous ?

Hemiparesis
- upper extremity
- lower extermity

Aphasia
- fluent
- non-fluent

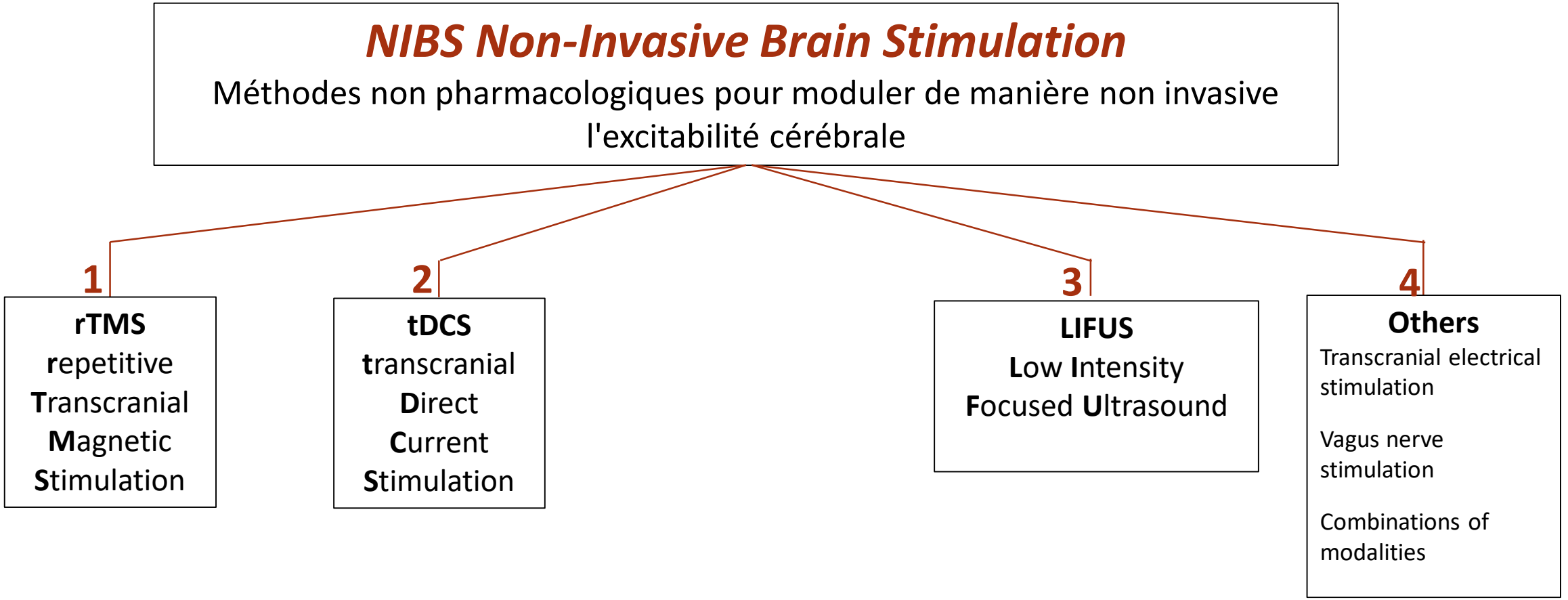


Neglect
- viusospatial
- hemi-sensory

Ataxia
- gait ataxia
- limb ataxia

Dysphagia

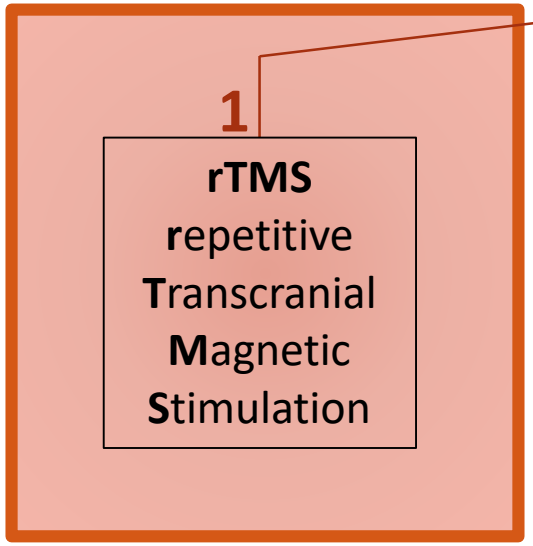
Comment traitons-nous ?



Comment traitons-nous ?

NIBS Non-Invasive Brain Stimulation

Méthodes non pharmacologiques pour moduler de manière non invasive l'excitabilité cérébrale



1

rTMS
repetitive
Transcranial
Magnetic
Stimulation

2

tDCS
transcranial
Direct
Current
Stimulation

3

LIFUS
Low **I**ntensity
Focused **U**ltrasound

4

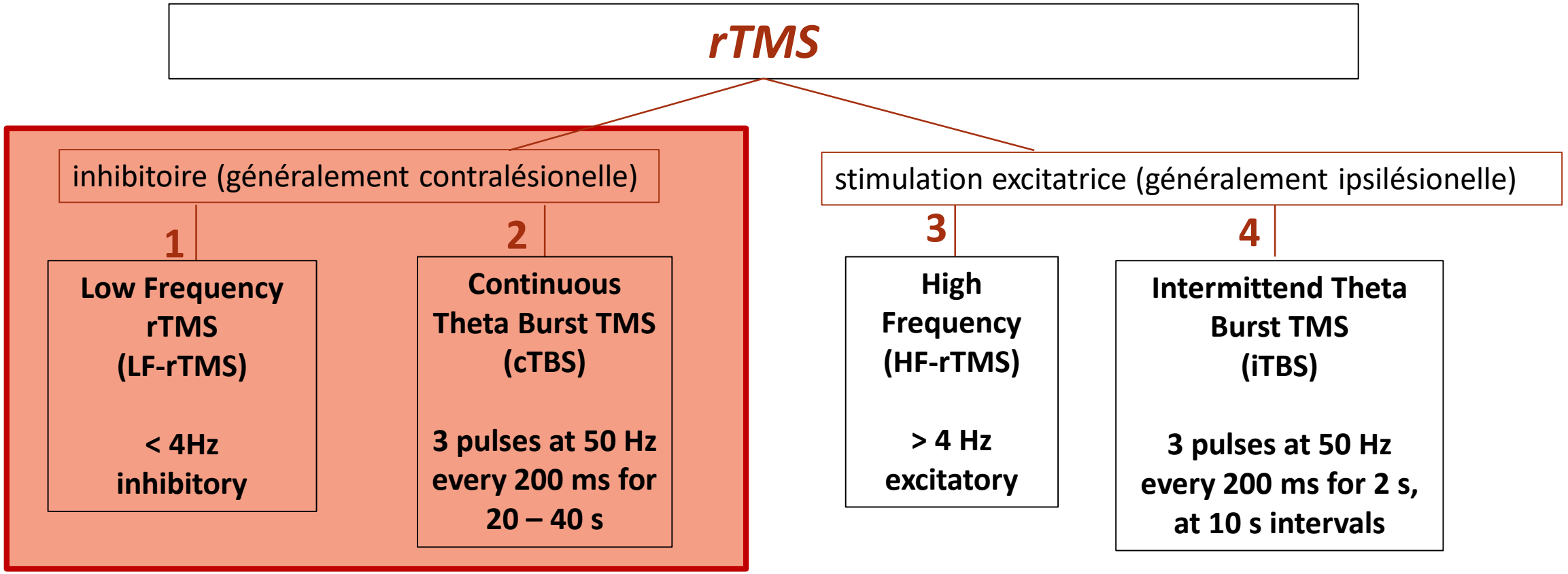
Others

Transcranial electrical stimulation

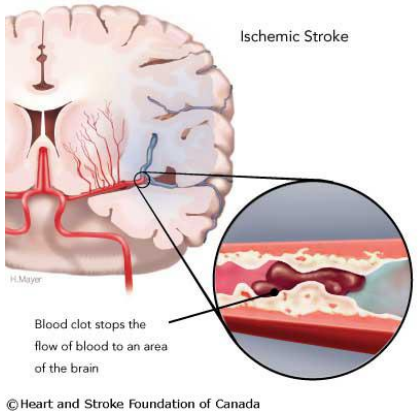
Vagus nerve stimulation

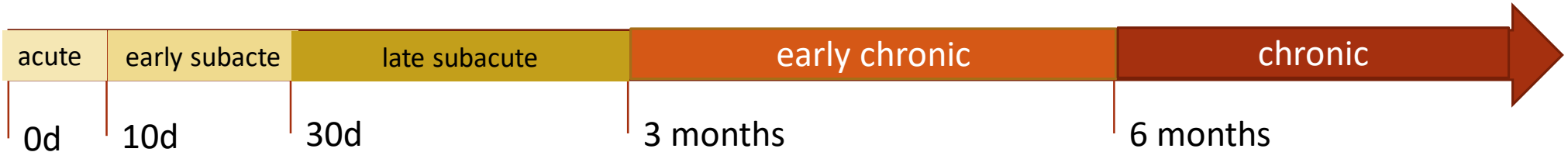
Combinations of modalities

Inhibition vs. Excitation



Quand traiton-nous ?





Fenêtre de temps de réadaption typique
dans la plupart des systèmes de santé publique

Récupération de la fonction motrice subaiguë contralésionelle (inhibitoire), M1

- 10 sham controlled RCT (2014-20) with > 10 participants
- Enrolling total of 498 patients
- Methodological quality
  - 1 Class I
  - 8 Class II
  - 1 Class III
- Improvement of the affected limb reported in 9/10
  - 6 FMA-UL
  - 1 dexterity UL
  - 2 leg mobility
- No improvement 1/10 of LL
- Lasting effects
  - 4/10 between 3-6 months
  - Not tested in 6/10

Lefaucheur et. al, Clinical Neurophysiology 131 (2020) 474–528
Du et. al, Neuroimage Clinical 2019; 21:1:10620

Niveau d'évidence Classe A pour efficacité immediate et prolongée

- ➢ 1 essai positive Class I
- ➢ 2 essais positives Class II

Récupération de la fonction motrice chronique contralésionelle (inhibitoire), M1

- 3 sham controlled RCT (2014-20) with > 10 participants
- Enrolling total of 245 patients
- Methodological quality
  - 1 Class I (199 participants)
  - 2 Class III
- Improvement of the affected limb reported in 2/3
  - 1 FMA-UL
  - 1 FM LL
- No improvement 1/3 of UL
- Lasting effects
  - 1/3 3 months
  - Not tested in 1/2

Lefaucheur et. al, Clinical Neurophysiology 131 (2020) 474–528

Évidence pour l'efficacité immediate

➢ 2 essais positive Classe III

Évidence pour non-efficacité

➢ 1 essai negative Class I

Récupération d'aphasie subaiguë contralésionelle (inhibitoire), M1

- 2 sham controlled RCT (2014-20) with > 10 participants
- Enrolling total of 93 patients
- Methodological quality
  - 1 Class I
  - 1 Class III
- Improvement of the language function 1/2
  - 1 picture naming
  - 1 global aphasia score
  - 1 functional communication
- Delayed effect
  - 1/2 at 1 months
  - Not tested in 1/1

Lefaucheur et. al, Clinical Neurophysiology 131 (2020) 474–528
Zumbansen et. al, European Stroke Journal 2020; 21:1:10620

Prior to 2014
4 sham controlled RCT
2 Class II 1 positive 1 negative
2 Class III 1 positive 1 negative

Niveau d'évidence Classe B pour l'efficacité

- 1 essai positive Classe I
- 1 essai positive Classe III

Original research article

EUROPEAN STROKE JOURNAL

Non-invasive brain stimulation as add-on therapy for subacute post-stroke aphasia: a randomized trial (NORTHSTAR)

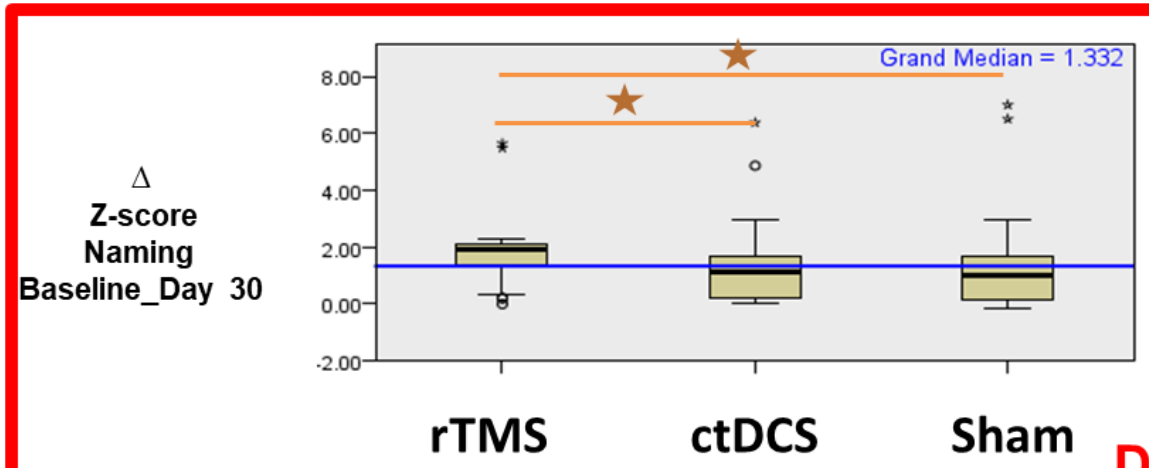
European Stroke Journal
0(0) 1–11

DOI: 10.1177/2396987320934935
journals.sagepub.com/home/eso
SAGE

Anna Zumbansen[1], Sandra E Black[2], Joyce L Chen[3], Dylan J Edwards[4,5,6], Alexander Hartmann[7], Wolf-Dieter Heiss[8], Sylvain Lanthier[9], Paul Lesperance[10], George Mochizuki[11], Caroline Paquette[12], Elizabeth A Rochon[13], Ilona Rubi-Fessen[14], Jennie Valles[15], Heike Kneifel[14], Susan Wortman-Jutt[4,15] and Alexander Thiel[1]; on behalf of the NORTHSTAR-study group*

EUROPEAN STROKE JOURNAL

- **rTMS [n=20] / ctDCS [n=24] / Sham [n=19]** ➢ No significant difference in changes at D1



➢ Significant difference in favor of **rTMS** for Δ **Naming** at **Day 30** (p=.010)

rTMS median 1.91 > ctDCS median 1.11
> Sham median 1.02

Delayed effect of rTMS on Naming

87% larger increase with rTMS (vs. sham stimulation)

Récupération de la fonction motrice chronique

contralésionelle (inhibitoire), M1

- 6 sham controlled RCT (2014-20) with > 10 participants
- Enrolling total of 156 patients
- Methodological quality
  - 3 Class II
  - 3 Class III
- Improvement of the language function 5/6
  - 4 picture naming
  - 1 global aphasia score
- No improvement 1/10
- Lasting effect
  - 3/6 at 2-3 months
  - Not tested in 3/6

Lefaucheur et. al, Clinical Neurophysiology 131 (2020) 474–528

Harvey et al, Brain and Language 2019 May;192:25-34

Heikkinen et al, Front inNeuroscience 2019 Feb

Niveau d'evidence Classe B

- 2 essais positives Classe II
- 2 essais psoitives Classe III

Où est-ce qu‘on proche d‘ une application clinique ?

Treating patients with

1) Hemiparesis
2) In the subacute phase
3) With inhibitory contralesional rTMS

Treating patients with

1) Aphasia
2) In the subacute or chronic phase
3) With inhibitory contralesional rTMS/(tDCS ?)

yields better outomes than treating patients with rehabilitation interventions only.

Les prochaines étapes ?

- Générer des preuves de classe I, phase III pour les paradigmes avec n> 200 (essais internationaux multicentriques) pour approbation réglementaire

- Des études NIBS passionnantes sont déjà en cours
    - motor recovery studies: 4 with n > 100
      5 with n = 30 – 60
    - aphasia recovery: 1 with n > 100

- Le but pour la prochaine étape est là ....

- Générer
- Des étud
- Le but p

Canadian Platform for Trials in Non-Invasive Brain Stimulation (CanStim) Consensus Recommendations for Repetitive Transcranial Magnetic Stimulation in Upper Extremity Motor Stroke Rehabilitation Trials

CanStim

Jodi D. Edwards, PhD[1]; Sandra E. Black, MD[2,3,11]; Shaun Boe PT, PhD[4], Lara Boyd, PT, PhD[5]; Arthur Chaves[6]; Robert Chen, MA, MBBChir, MSc,[3,7]; Sean Dukelow, MD, PhD,[8]; Joyce Fung, PhD[9]; Adam Kirton, MD[10]; Jed Meltzer, PhD[11]; Zahra Moussavi, PhD[12]; Jason Neva PhD[5]; Caroline Paquette, PhD[13]; Michelle Ploughman, PT, PhD[6]; Sepideh Pooyania, MD[14]; Tarek K. Rajji, MD[15,16]; Marc Roig, PhD[9]; Francois Tremblay, PhD[17]; **Alexander Thiel, MD[18]**

University of Ottawa Heart Institute1; Department of Medicine (Neurology) Sunnybrook Health Science Centre, University of Toronto2; Hurvitz Brain Sciences Research Program, Sunnybrook Research Institute3; School of Physiotherapy, Dalhousie University4; Department of Physical Therapy, University of British Columbia5; Faculty of Medicine, Memorial University6; Toronto Western Hospital7; Department of Clinical Neurosciences, University of Calgary8; School of Physical and Occupational Therapy, McGill University9; Departments of Pediatrics and Clinical Neuroscience, Cumming School of Medicine, University of Calgary10; Rotman Research Institute, Baycrest Hospital11; Department of Electrical and Computer Engineering, University of Manitoba12; Department of Kinesiology and Physical Education, McGill University13; Division of Physical Medicine and Rehabilitation, Department of Internal Medicine, University of Manitoba14; Department of Psychiatry, University of Toronto15; Centre for Addiction and Mental Health16; Faculty of Health Sciences, University of Ottawa17; Division of Neurology, Department of Medicine, McGill University18

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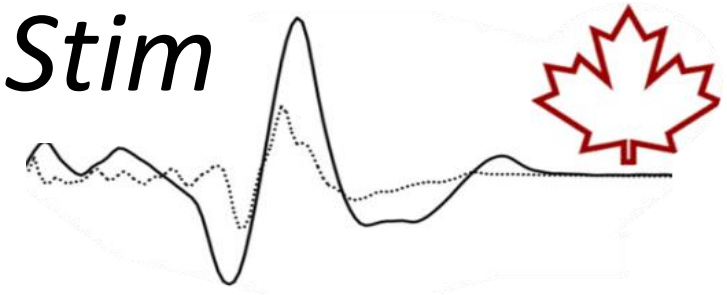

Merci !

Dr. Alexander Thiel

For the CanStim Investigative Team