بسم الله الرحمن الرحيم

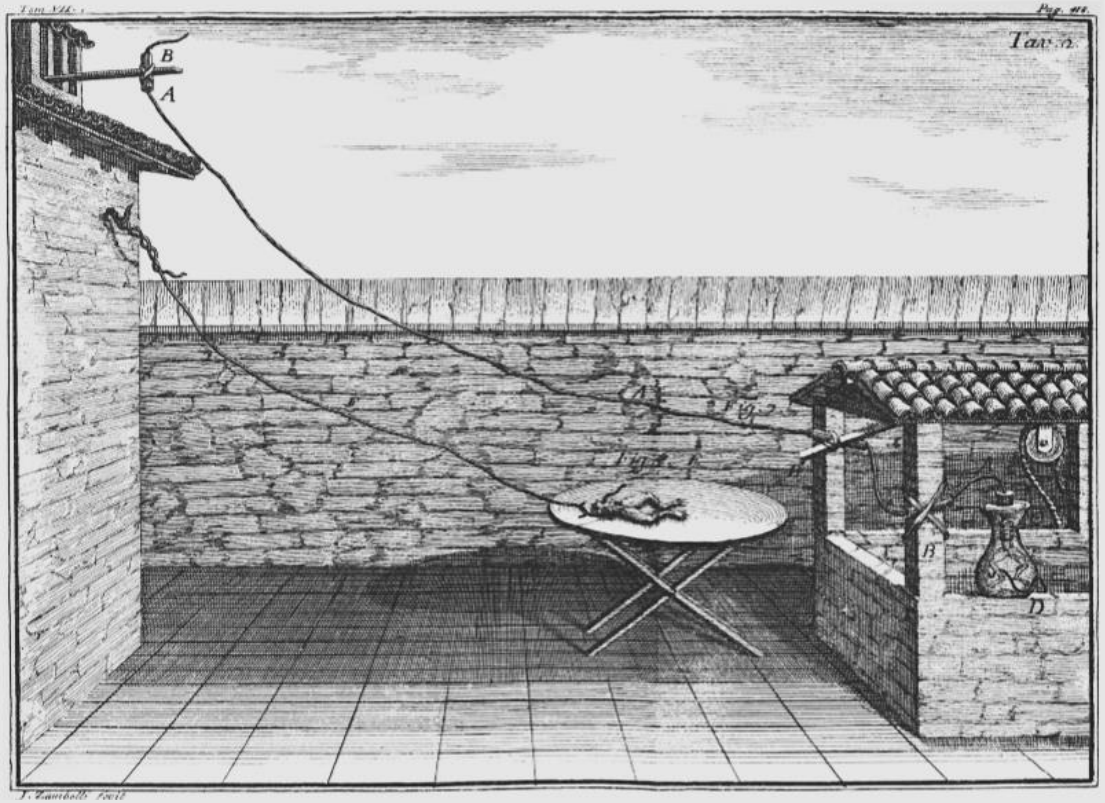
Applications of GVS

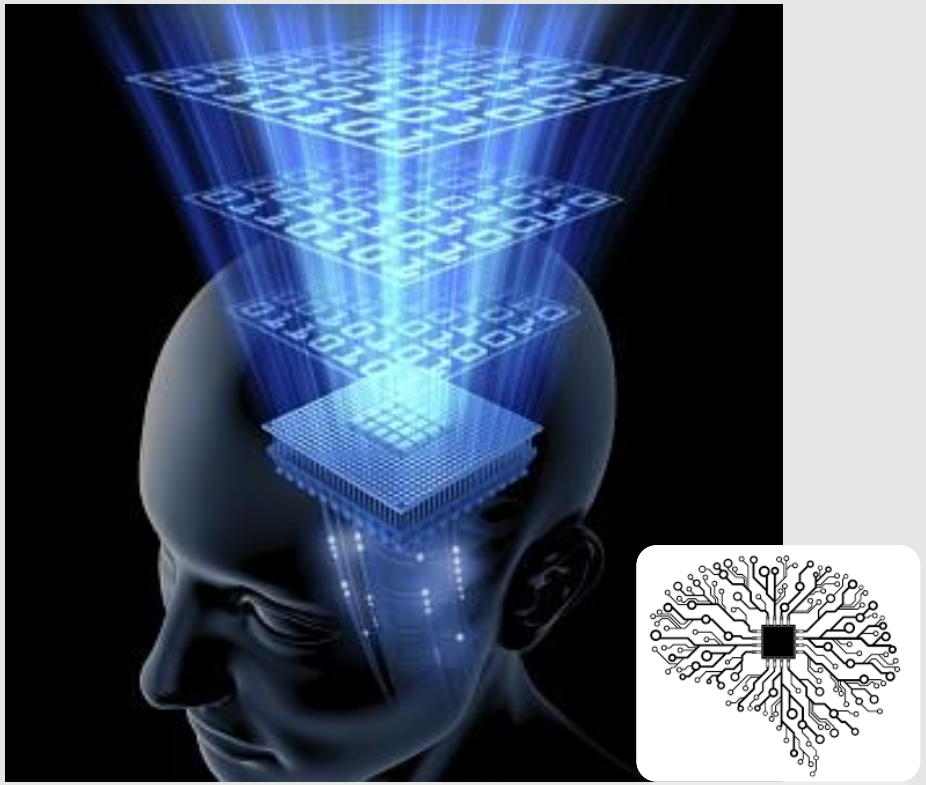
By:

Dr. Moslem Shaabani

Assistant Professor (USWR)

From Galvani to Neuromorphic engineering

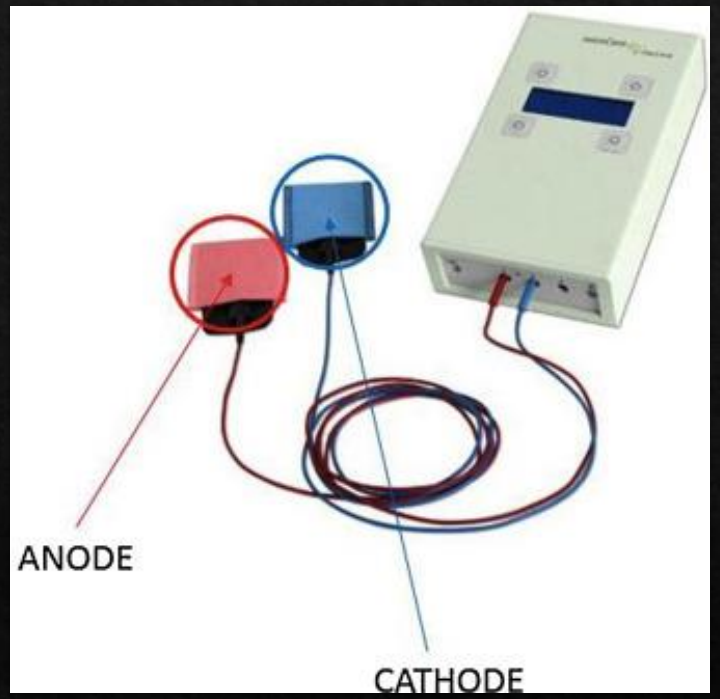


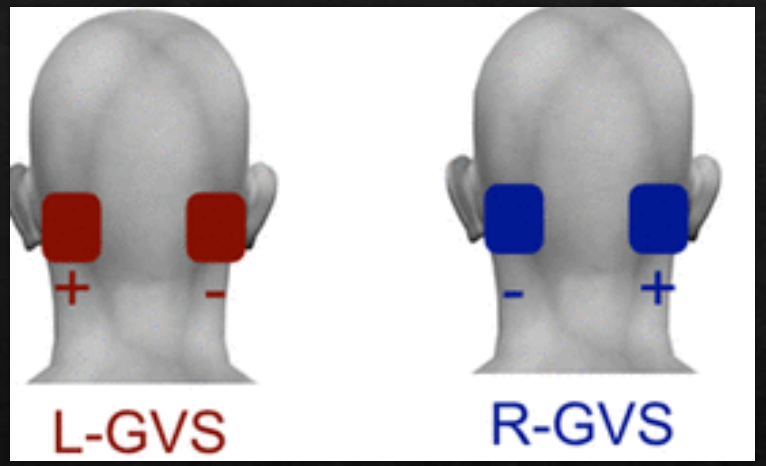


Galvanic Vestibular Stimulation (GVS)

Device and Electrode montage

Stimulation Types and Levels



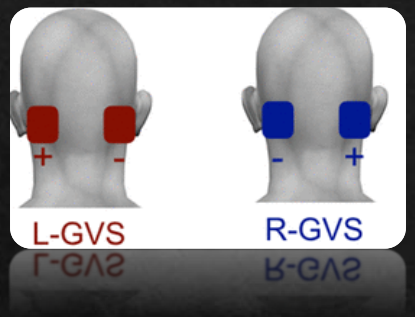


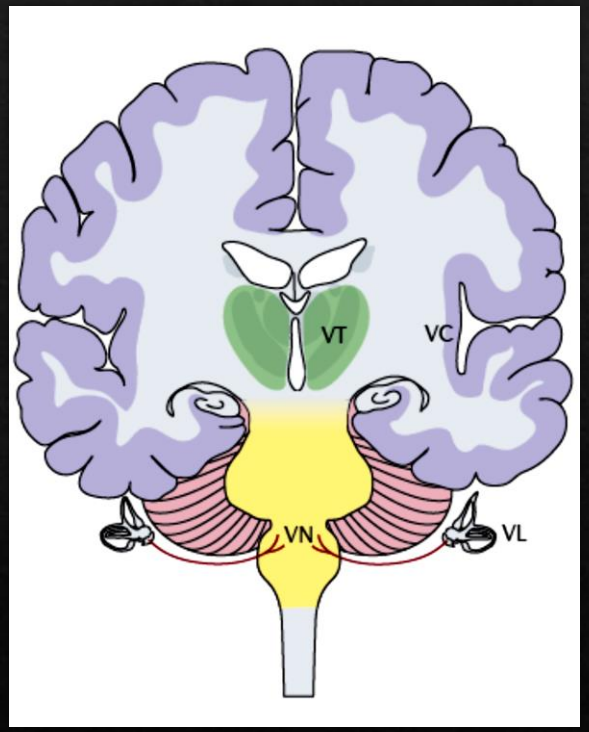
Pulsatile
Sinusoidal
Stochastic or noisy GVS (nGVS)

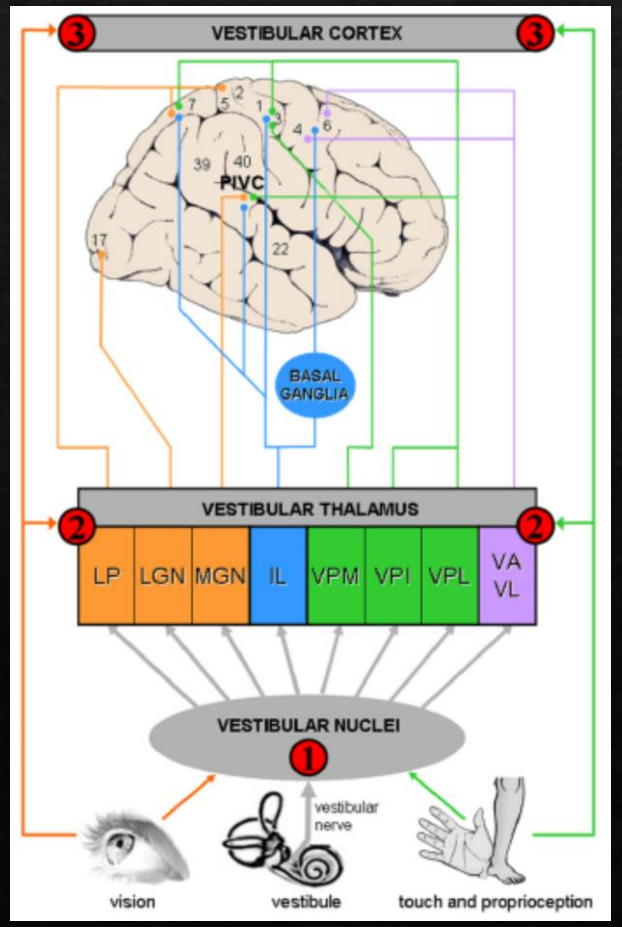
Threshold Level
Sub-threshold level
Supra-threshold level

Galvanic Vestibular Stimulation (GVS)

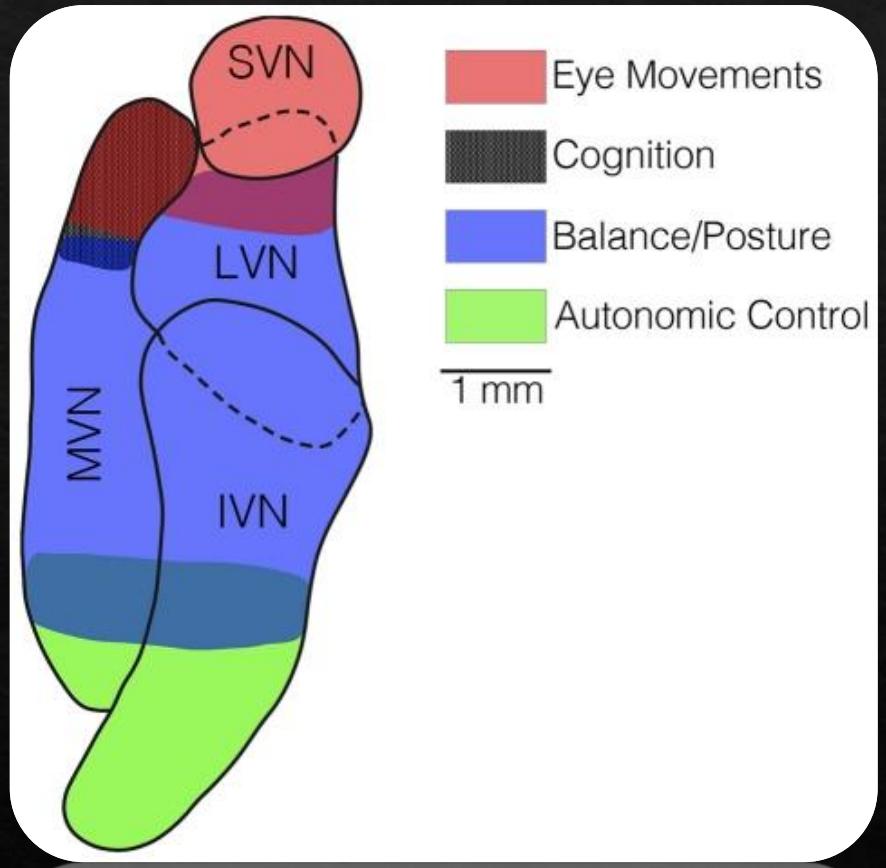
Potential neural pathway







Galvanic Vestibular Stimulation (GVS)
Potential applications



frontiers in NEUROLOGY

REVIEW ARTICLE
published: 27 December 2011
doi: 10.3389/fneur.2011.00088

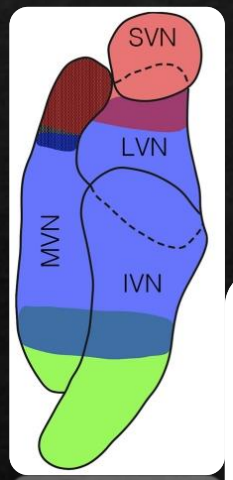
Compensation following bilateral vestibular damage

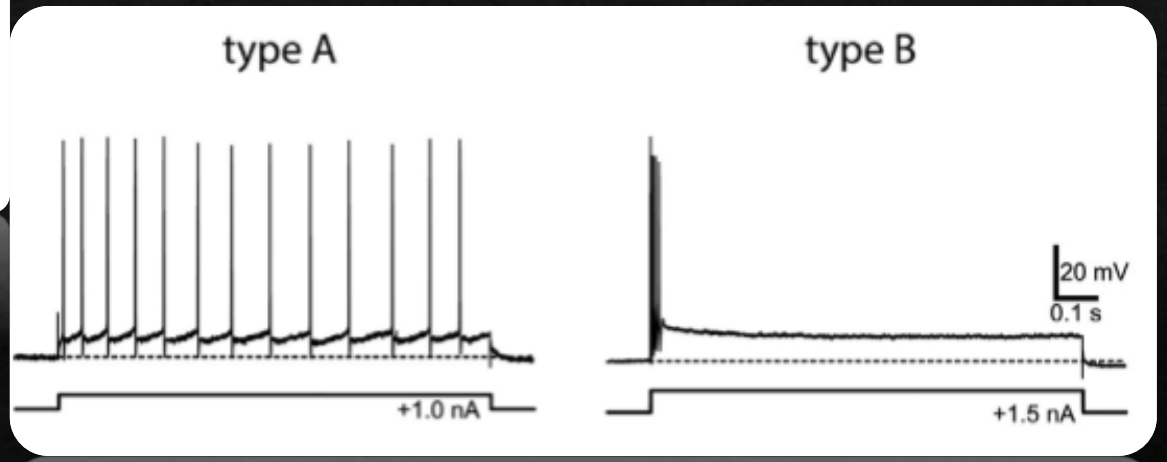
Andrew A. McCall and Bill J. Yates*

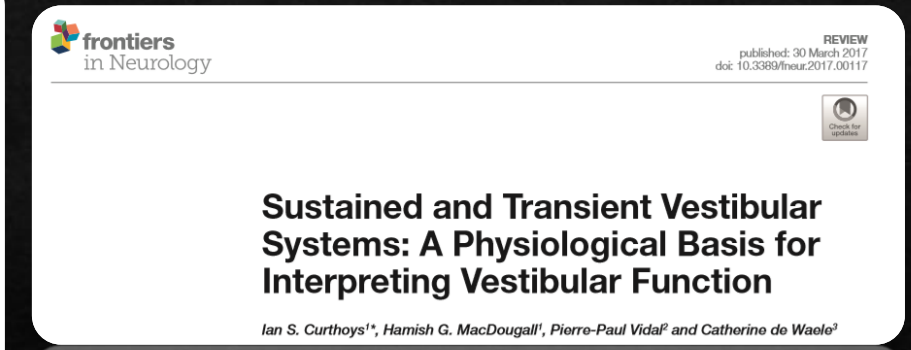
Department of Otolaryngology, University of Pittsburgh, Pittsburgh, PA, USA

Galvanic Vestibular Stimulation (GVS)

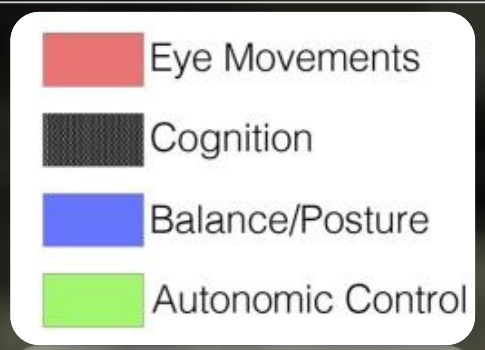
Potential applications (based on two vestibular systems)

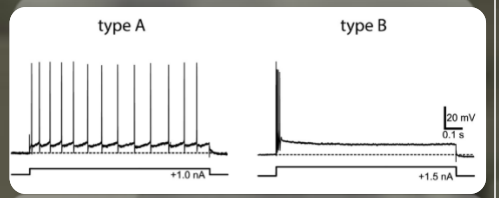






- Basic Science applications
- Evaluation applications
- Interventional and Clinical applications

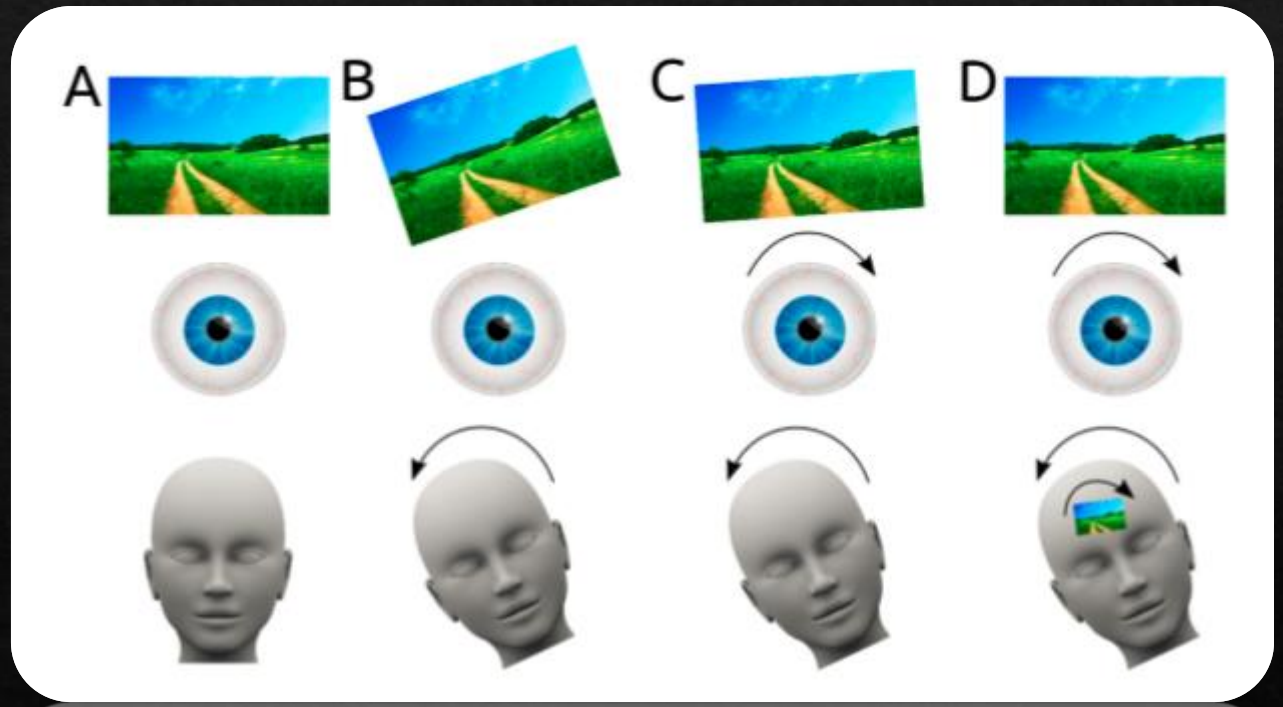




GALVANIC VESTIBULAR STIMULATION (GVS)
POTENTIAL APPLICATIONS

Galvanic Vestibular Stimulation (GVS)

Basic science: Ocular torsion and Ocular tilt



vision

MDPI

Article

Beyond the Vestibulo-Ocular Reflex: Vestibular Input is Processed Centrally to Achieve Visual Stability

Edwin S. Dalmaijer

MRC Cognition and Brain Sciences Unit, University of Cambridge, Cambridge CB2 1TN, UK; edwin.dalmaijer@mrc-cbu.cam.ac.uk; Tel.: +44(0)-1223-355-294

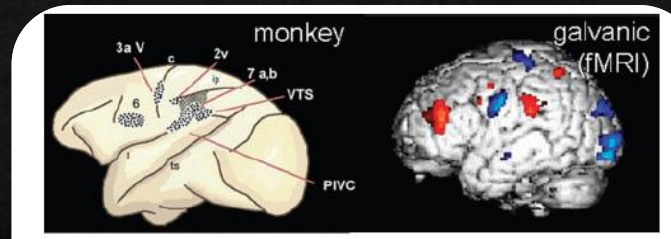
Galvanic Vestibular Stimulation (GVS)
Basic Science: Gain regulation mechanism
Visual-vestibular modulation; Somatosensory-vestibular modulation

doi:10.1093/brain/awn042 Brain (2008), 131, 2538–2552

REVIEW ARTICLE

Functional brain imaging of peripheral and central vestibular disorders

Marianne Dieterich[1] and Thomas Brandt[2]

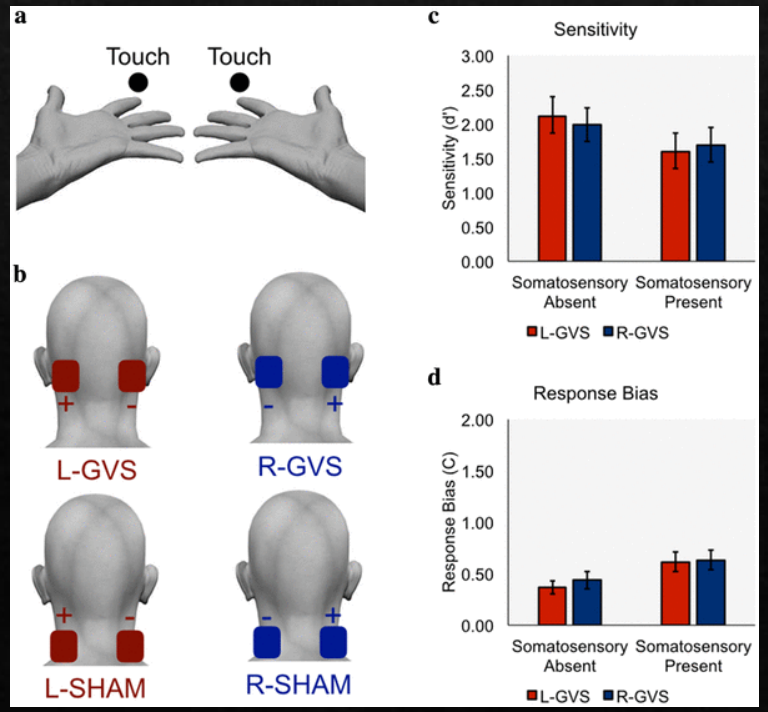


Experimental Brain Research (2018) 236:859–865
https://doi.org/10.1007/s00221-018-5167-9

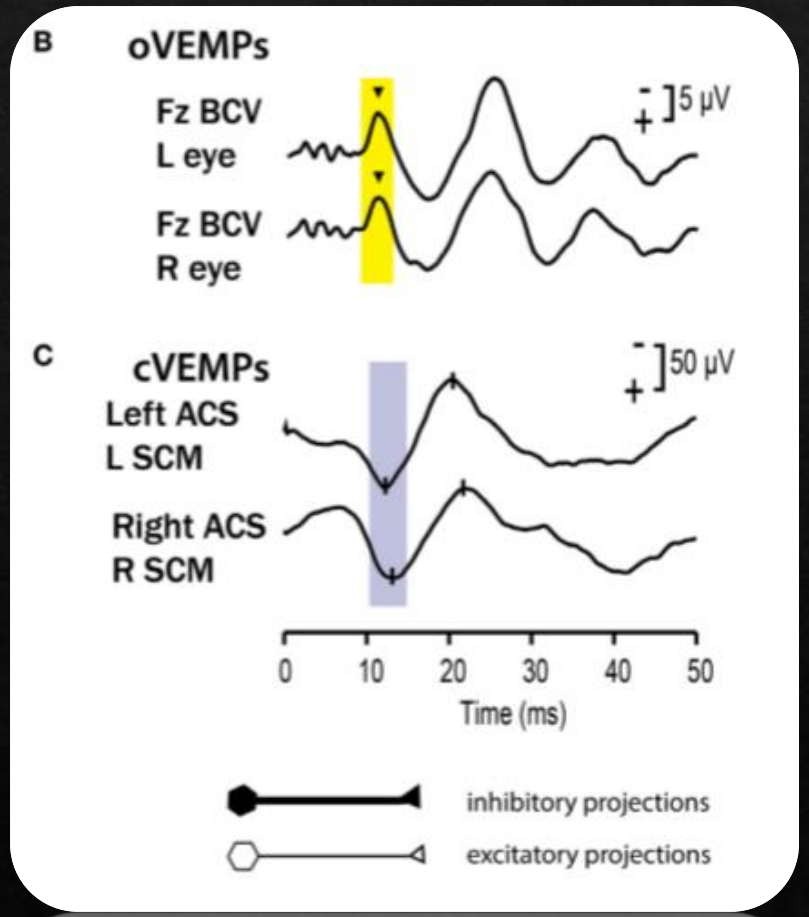
RESEARCH ARTICLE

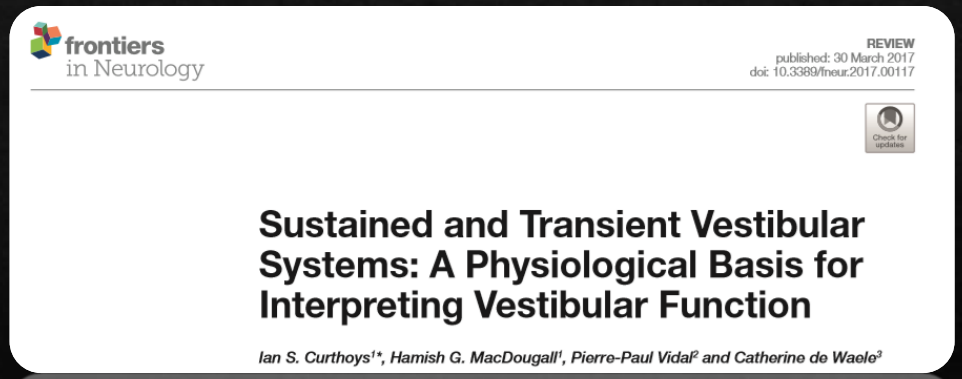
Somatosensory modulation of perceptual vestibular detection

Katerina Cabolis[1] · Anne Steinberg[1] · Elisa Raffaella Ferrè[1]



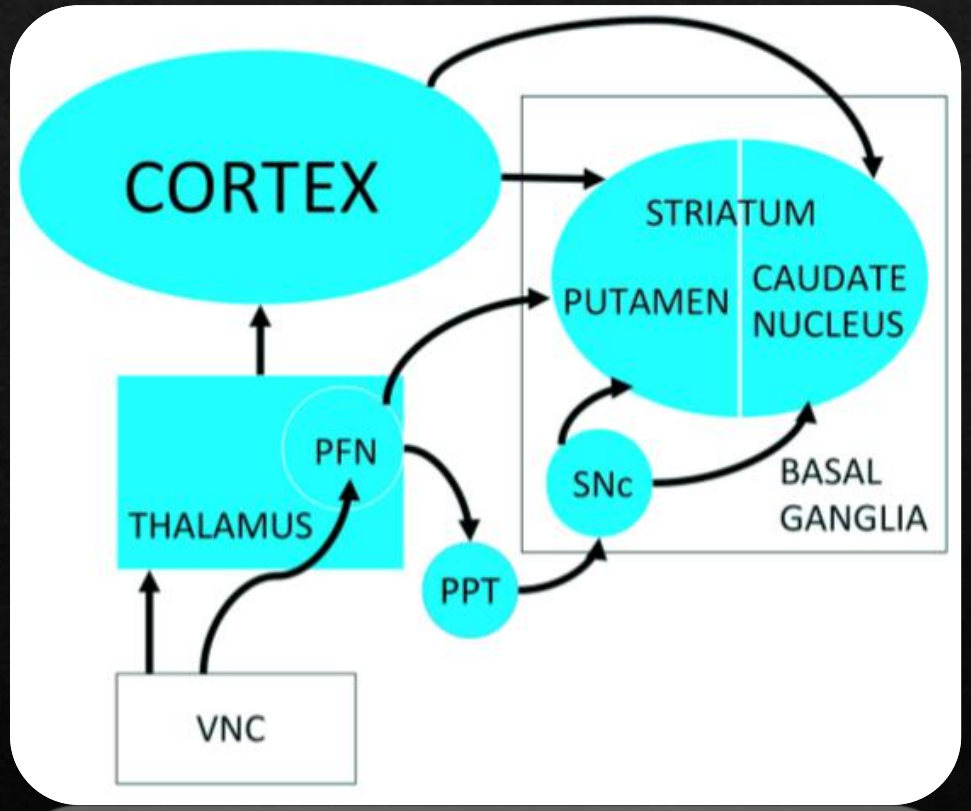
Galvanic Vestibular Stimulation (GVS)
Evaluation: VEMPs





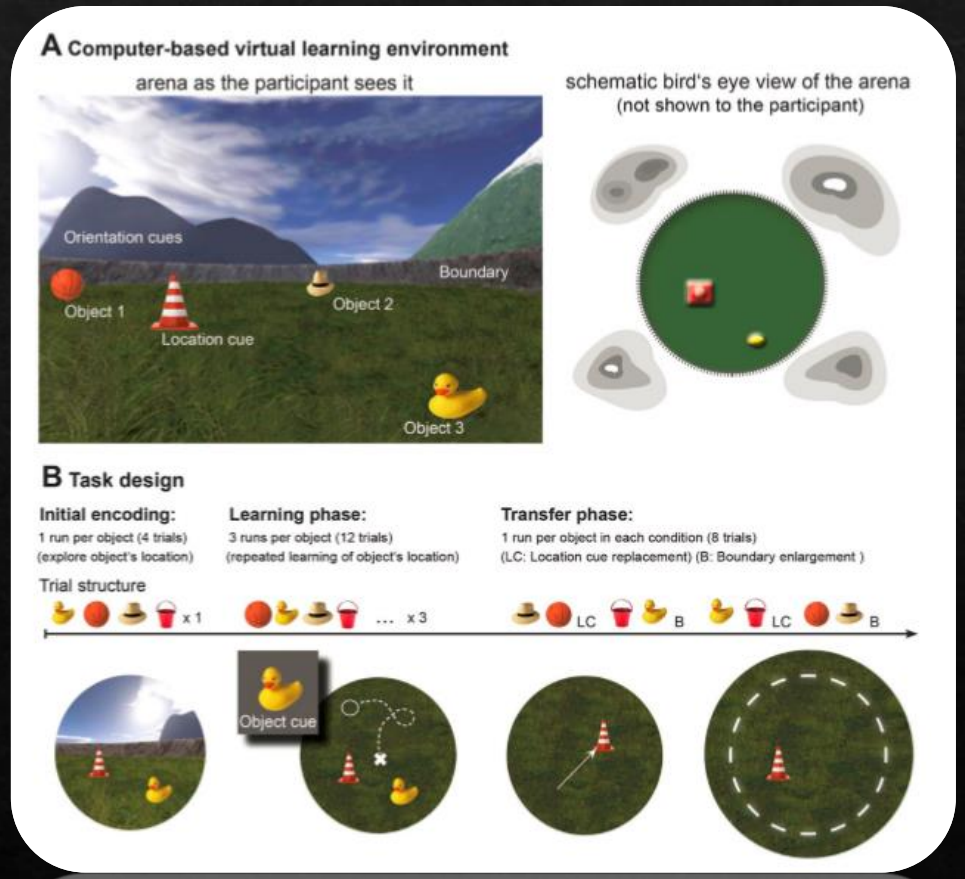
Galvanic Vestibular Stimulation (GVS)

Intervention: Parkinson's Disease



Galvanic Vestibular Stimulation (GVS)

Intervention: Spatial memory (Hippocampal, Striatal)



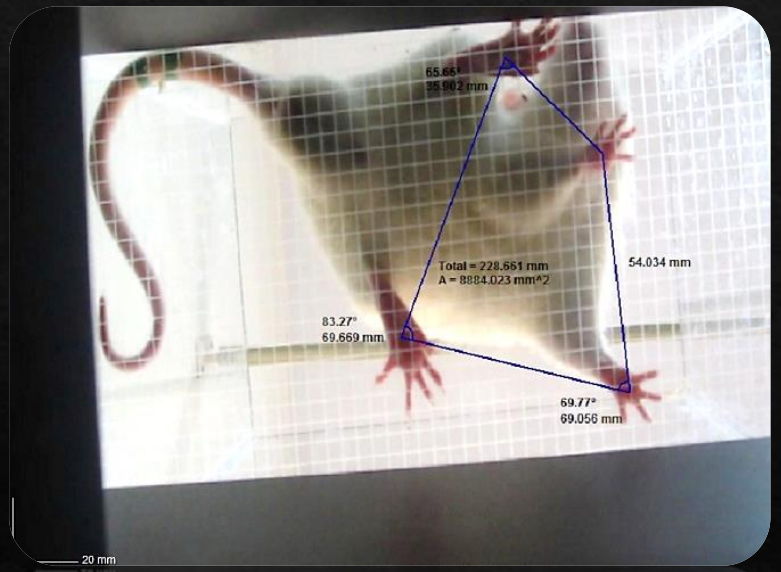

www.nature.com/scientificreports
SCIENTIFIC REPORTS
OPEN

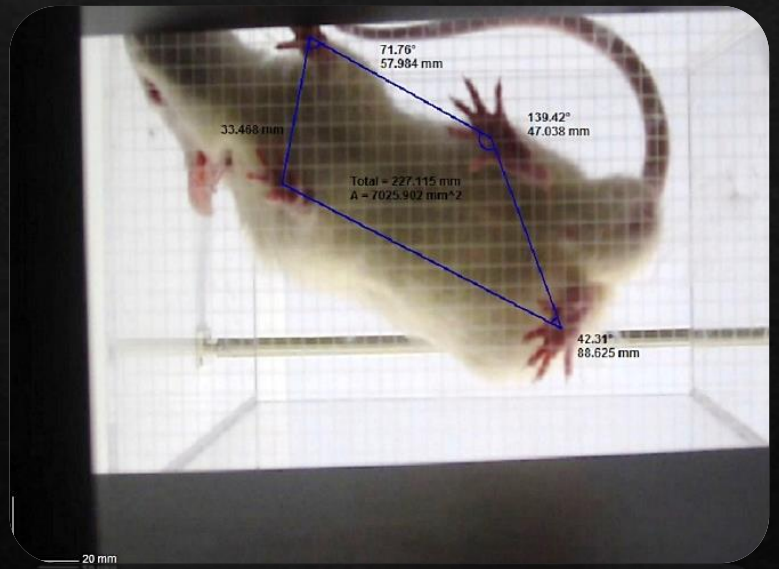
Noisy galvanic vestibular stimulation modulates spatial memory in young healthy adults

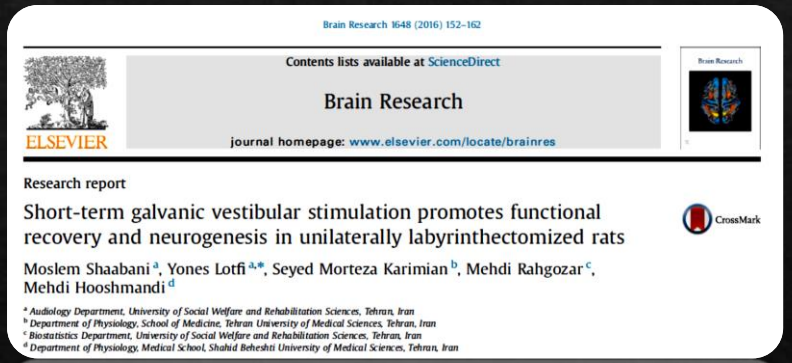
Received: 16 May 2018
Accepted: 14 June 2019

Danica Hilliard[1,2], Susanne Passow[3], Franka Thurm[3], Nicolas W. Schuck[4], Alexander Garthe[1,2], Gerd Kempermann[1,2] & Shu-Chen Li[3,5]

Galvanic Vestibular Stimulation (GVS) Intervention: Vestibular rehabilitation in UW rats







Brain Research 1648 (2016) 152–162

Contents lists available at ScienceDirect

Brain Research

journal homepage: www.elsevier.com/locate/brainres

Research report

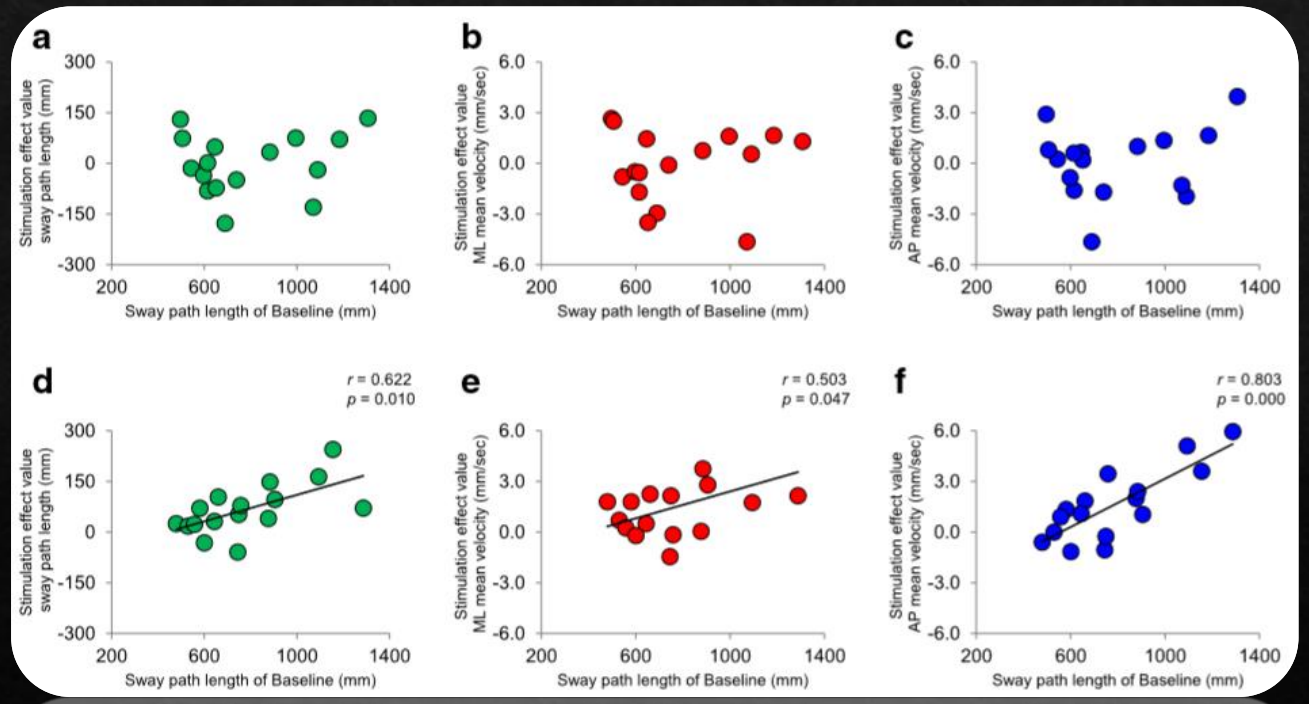
Short-term galvanic vestibular stimulation promotes functional recovery and neurogenesis in unilaterally labyrinthectomized rats

Moslem Shaabani [a], Yones Lotfi [a,*], Seyed Morteza Karimian [b], Mehdi Rahgozar [c], Mehdi Hooshmandi [d]

[a] Audiology Department, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
[b] Department of Physiology, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
[c] Biostatistics Department, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran
[d] Department of Physiology, Medical School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Galvanic Vestibular Stimulation (GVS) Intervention: COP sway and Falling

Sway path length; ML mean velocity; AP mean velocity



Inukai et al. Journal of NeuroEngineering and Rehabilitation (2018) 15:63
https://doi.org/10.1186/s12984-018-0407-6

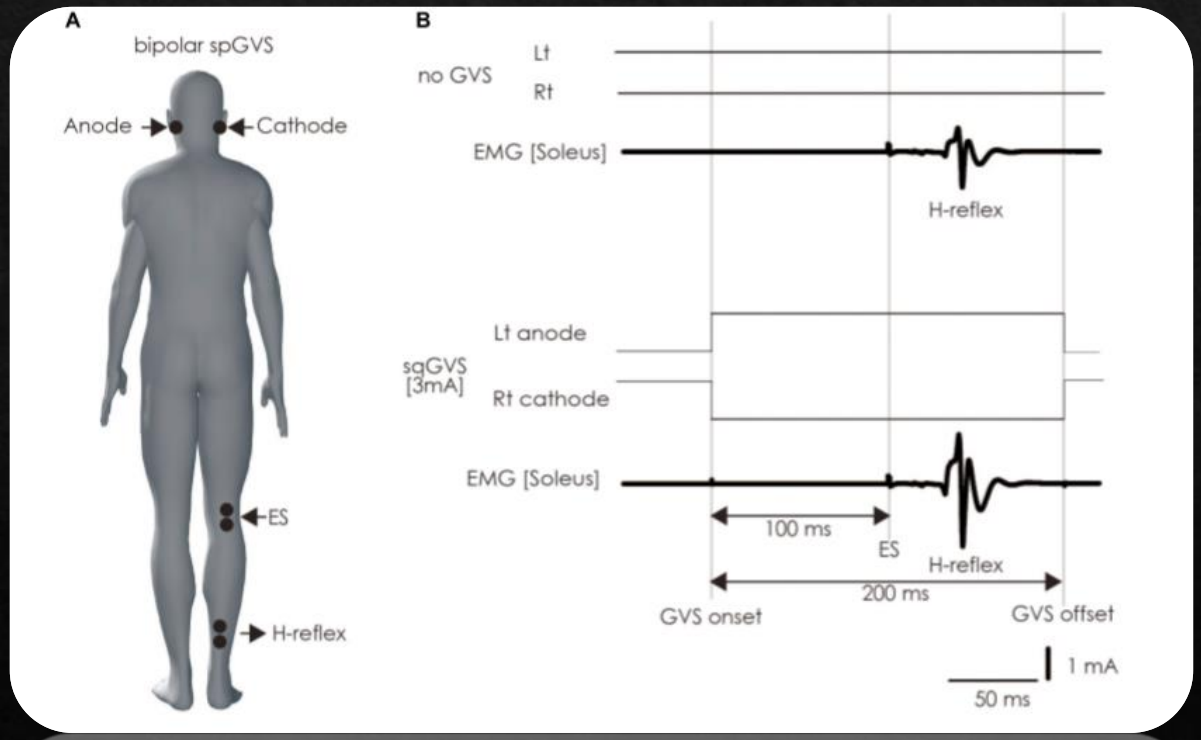
Journal of NeuroEngineering and Rehabilitation

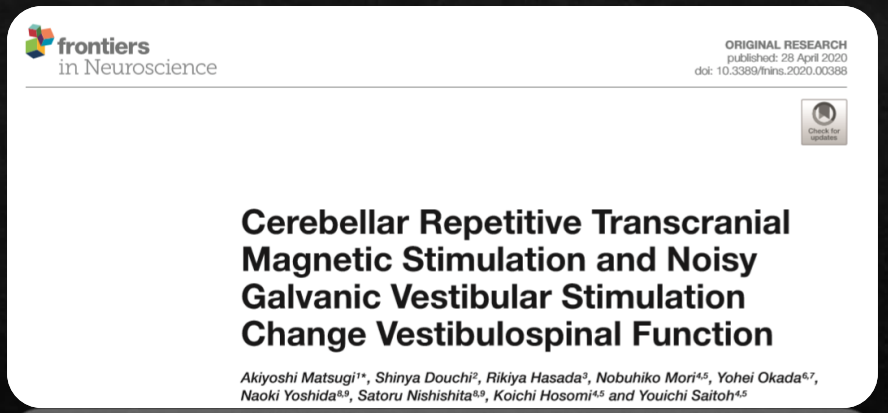
RESEARCH Open Access

Effect of noisy galvanic vestibular stimulation in community-dwelling elderly people: a randomised controlled trial

Yasuto Inukai[1,2*], Mitsuhiro Masaki[1,2], Naofumi Otsuru[1,2], Kei Saito[1,2], Shota Miyaguchi[1,2], Sho Kojima[1,2] and Hideaki Onishi[1,2]

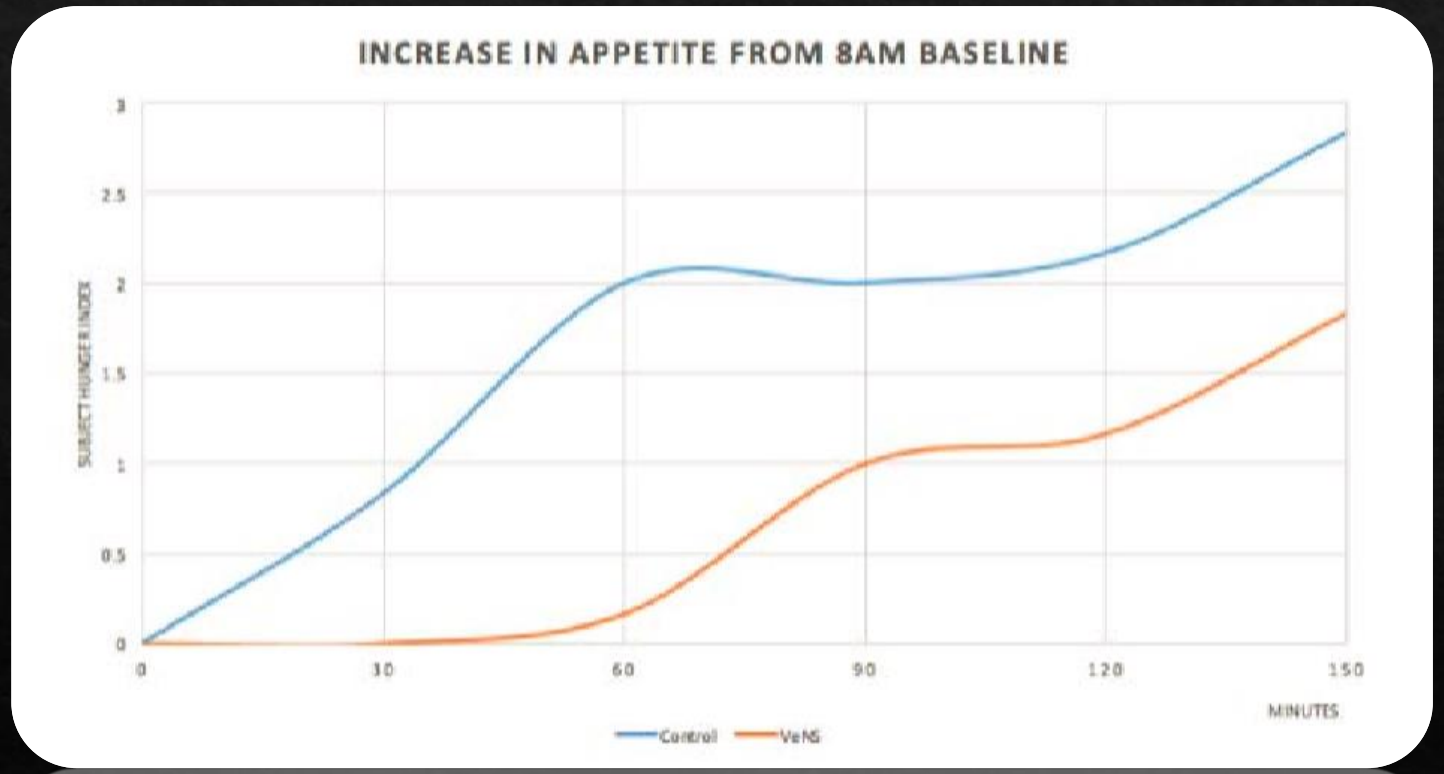
Galvanic Vestibular Stimulation (GVS) Basic Science and Intervention: VSR function





Galvanic Vestibular Stimulation (GVS)

A probable future application in weight loss diet!



Modulation of Body Mass Composition using Vestibular Nerve Stimulation.

Paul D. McGeoch, Jason McKeown, Hans Peterson & V.S. Ramachandran

Center for Brain and Cognition,

University of California, San Diego,

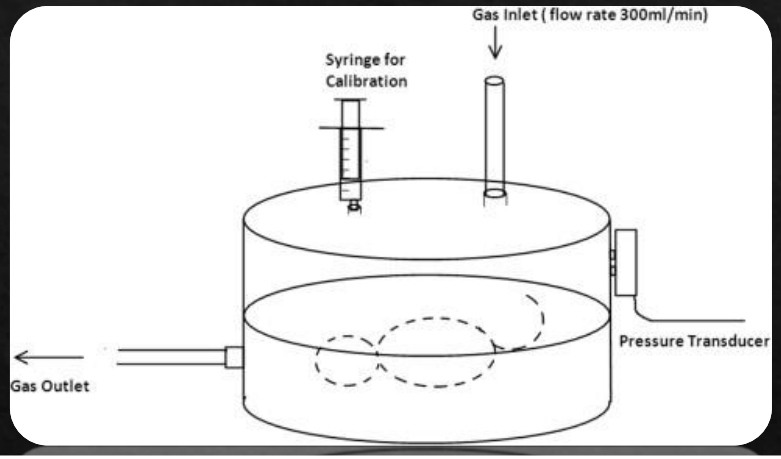
Mandler Hall, 9500 Gilman Drive #0109,

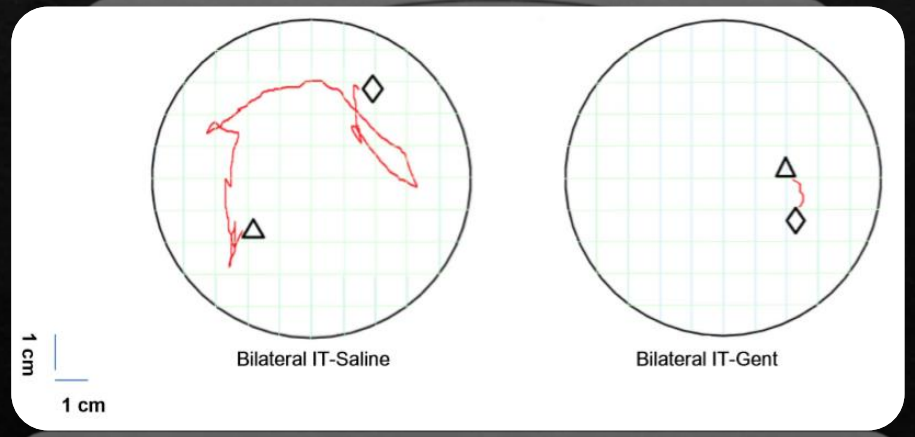
La Jolla, CA 92093-0109

USA

Galvanic Vestibular Stimulation (GVS)

A probable future application in SIDS!





Early Human Development (2008) 84, 225–229

available at www.sciencedirect.com

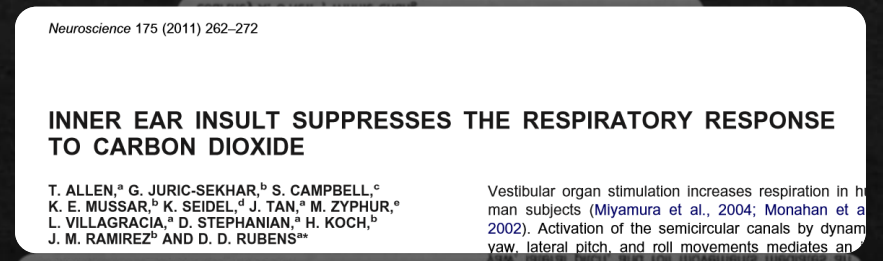
ScienceDirect

www.elsevier.com/locate/earlhumdev

ELSEVIER

Newborn oto-acoustic emission hearing screening tests Preliminary evidence for a marker of susceptibility to SIDS

Daniel D. Rubens [a,*], Betty R. Vohr [b], Richard Tucker [b], Courtney A. O'Neil [c], Winnie Chung [c]

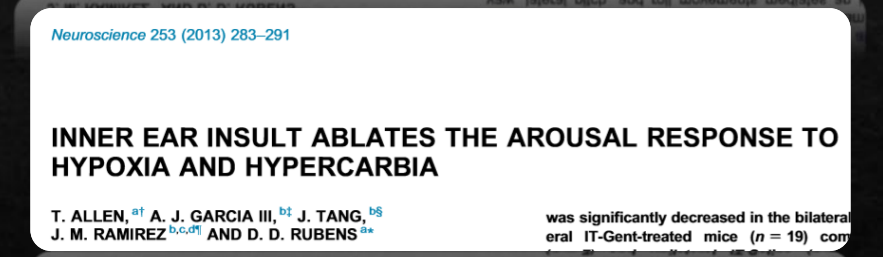


Neuroscience 175 (2011) 262–272

INNER EAR INSULT SUPPRESSES THE RESPIRATORY RESPONSE TO CARBON DIOXIDE

T. ALLEN,[a] G. JURIC-SEKHAR,[b] S. CAMPBELL,[c] K. E. MUSSAR,[b] K. SEIDEL,[d] J. TAN,[a] M. ZYPHUR,[e] L. VILLAGRACIA,[a] D. STEPHANIAN,[a] H. KOCH,[b] J. M. RAMIREZ[b] AND D. D. RUBENS[a*]

Vestibular organ stimulation increases respiration in h man subjects (Miyamura et al., 2004; Monahan et a 2002). Activation of the semicircular canals by dynam yaw, lateral pitch, and roll movements mediates an

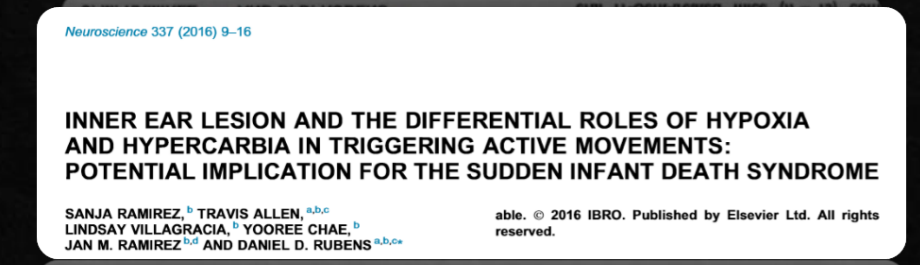


Neuroscience 253 (2013) 283–291

INNER EAR INSULT ABLATES THE AROUSAL RESPONSE TO HYPOXIA AND HYPERCARBIA

T. ALLEN,[a†] A. J. GARCIA III,[b‡] J. TANG,[b§] J. M. RAMIREZ[b,c,d¶] AND D. D. RUBENS[a*]

was significantly decreased in the bilateral eral IT-Gent-treated mice ($n = 19$) com



Neuroscience 337 (2016) 9–16

INNER EAR LESION AND THE DIFFERENTIAL ROLES OF HYPOXIA AND HYPERCARBIA IN TRIGGERING ACTIVE MOVEMENTS: POTENTIAL IMPLICATION FOR THE SUDDEN INFANT DEATH SYNDROME

SANJA RAMIREZ,[b] TRAVIS ALLEN,[a,b,c] LINDSAY VILLAGRACIA,[b] YOOREE CHAE,[b] JAN M. RAMIREZ[b,d] AND DANIEL D. RUBENS[a,b,c*]

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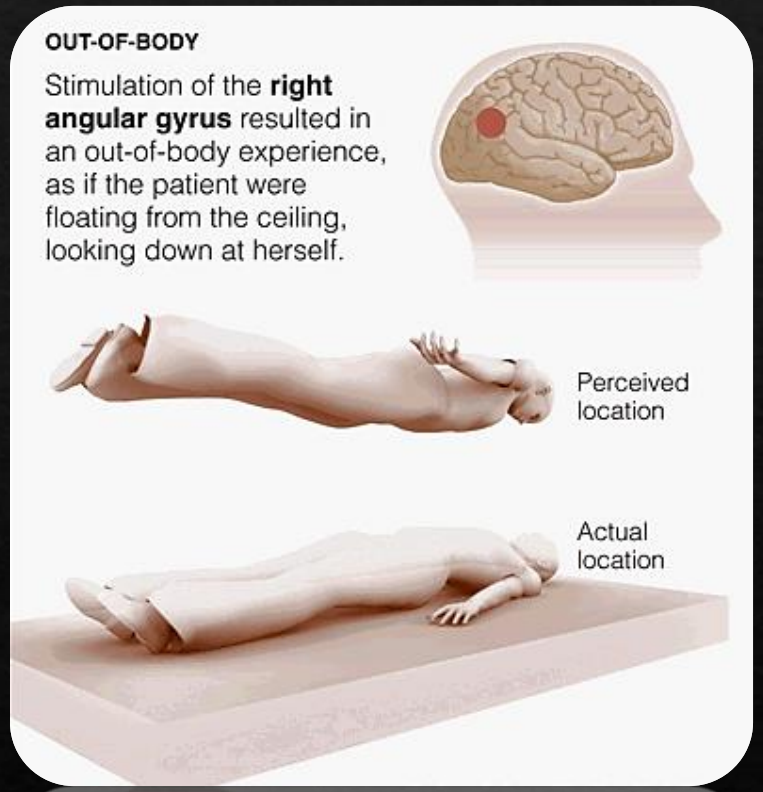
Galvanic Vestibular Stimulation (GVS)
A probable future application in Psychology!



frontiers in
INTEGRATIVE NEUROSCIENCE
REVIEW ARTICLE
published: 17 April 2014
doi: 10.3389/fnint.2014.00031

The vestibular system: a spatial reference for bodily self-consciousness

*Christian Pfeiffer[1,2], Andrea Serino[1,2,3] and Olaf Blanke[1,2,4]**

Conclusion

Lesson 1.

Specific stimulation but widespread modulation

Lesson 2.

Visual-Vestibular modulation

Lesson 3.

Somatosensory-Vestibular modulation

Lesson 4.

Vestibular rehabilitation

Lesson 5.

Vestibulo-autonomic modulation

THANK YOU!