



## Reviews and Guidelines

## Non-invasive electrical and magnetic stimulation of the brain, spinal cord, roots and peripheral nerves: Basic principles and procedures for routine clinical and research application. An updated report from an I.F.C.N. Committee



P.M. Rossini<sup>a</sup>, D. Burke<sup>b</sup>, R. Chen<sup>c</sup>, L.G. Cohen<sup>d</sup>, Z. Daskalakis<sup>e</sup>, R. Di Iorio<sup>a,\*</sup>, V. Di Lazzaro<sup>f</sup>, F. Ferreri<sup>f,g</sup>, P.B. Fitzgerald<sup>h</sup>, M.S. George<sup>i</sup>, M. Hallett<sup>j</sup>, J.P. Lefaucheur<sup>k,l</sup>, B. Langguth<sup>m</sup>, H. Matsumoto<sup>n</sup>, C. Miniussi<sup>o,p</sup>, M.A. Nitsche<sup>q</sup>, A. Pascual-Leone<sup>r</sup>, W. Paulus<sup>s</sup>, S. Rossi<sup>t</sup>, J.C. Rothwell<sup>u</sup>, H.R. Siebner<sup>v,w</sup>, Y. Ugawa<sup>x</sup>, V. Walsh<sup>y</sup>, U. Ziemann<sup>z</sup>

<sup>a</sup> Institute of Neurology, Department of Geriatrics, Neuroscience and Orthopedics, Catholic University, Policlinic A. Gemelli, Rome, Italy

<sup>b</sup> Department of Neurology, Royal Prince Alfred Hospital, University of Sydney, Sydney, Australia

<sup>c</sup> Division of Neurology, Toronto Western Research Institute, University of Toronto, Toronto, Ontario, Canada

<sup>d</sup> Human Cortical Physiology and Neurorehabilitation Section, NINDS, NIH, Bethesda, MD, USA

<sup>e</sup> Temerty Centre for Therapeutic Brain Intervention, Centre for Addiction and Mental Health, University of Toronto, Toronto, Ontario, Canada

<sup>f</sup> Department of Neurology, University Campus Bio-medico, Rome, Italy

<sup>g</sup> Department of Clinical Neurophysiology, University of Eastern Finland, Kuopio, Finland

<sup>h</sup> Monash Alfred Psychiatry Research Centre, Monash University Central Clinical School and The Alfred, Melbourne, Australia

<sup>i</sup> Medical University of South Carolina, Ralph H. Johnson VA Medical Center, Charleston, SC, USA

<sup>j</sup> Human Motor Control Section, Medical Neurology Branch, NINDS, NIH, Bethesda, MD, USA

<sup>k</sup> Department of Physiology, Henri Mondor Hospital, Assistance Publique – Hôpitaux de Paris, Créteil, France

<sup>l</sup> EA 4391, Nerve Excitability and Therapeutic Team, Faculty of Medicine, Paris Est Créteil University, Créteil, France

<sup>m</sup> Department of Psychiatry and Psychotherapy, University of Regensburg, Regensburg, Germany

<sup>n</sup> Department of Neurology, Japanese Red Cross Medical Center, Tokyo, Japan

<sup>o</sup> Department of Clinical and Experimental Sciences University of Brescia, Brescia, Italy

<sup>p</sup> IRCCS Centro San Giovanni di Dio Fatebenefratelli, Brescia, Italy

<sup>q</sup> Department of Clinical Neurophysiology, University Medical Center Göttingen, Georg-August-University, Göttingen, Germany

<sup>r</sup> Berenson-Allen Center for Non-invasive Brain Stimulation, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA, USA

<sup>s</sup> Department of Clinical Neurophysiology, Georg-August University, Göttingen, Germany

<sup>t</sup> Brain Investigation & Neuromodulation Lab, Unit of Neurology and Clinical Neurophysiology, Department of Neuroscience, University of Siena, Siena, Italy

<sup>u</sup> Institute of Neurology, University College London, London, United Kingdom

<sup>v</sup> Department of Neurology, Copenhagen University Hospital Bispebjerg, Copenhagen, Denmark

<sup>w</sup> Danish Research Centre for Magnetic Resonance, Centre for Functional and Diagnostic Imaging and Research, Copenhagen University Hospital Hvidovre, Hvidovre, Denmark

<sup>x</sup> Department of Neurology, School of Medicine, Fukushima Medical University, Fukushima, Japan

<sup>y</sup> Institute of Cognitive Neuroscience, University College London, London, United Kingdom

<sup>z</sup> Department of Neurology & Stroke, and Hertie Institute for Clinical Brain Research, Eberhard Karls University, Tübingen, Germany

## ARTICLE INFO

## Article history:

Accepted 1 February 2015

Available online 10 February 2015

## Keywords:

Non-invasive stimulation

Transcranial magnetic stimulation

Human cortex

Clinical neurophysiology

## HIGHLIGHTS

- This review is an up-date document on basic aspects of non-invasive stimulation of brain, spinal cord and nerve roots.
- The main physiological, theoretical and methodological features of transcranial magnetic stimulation (TMS) are described.
- Instructions for practical use of non-invasive stimulation in clinical applications and research are provided.

\* Corresponding author at: Institute of Neurology, Department of Geriatrics, Neuroscience and Orthopedics, Catholic University, Policlinic A. Gemelli, L.go A. Gemelli 8, 00168 Rome, Italy. Tel.: +39 06 3015 4279; fax: +39 06 3550 1909.

E-mail address: [r.diiorio@live.it](mailto:r.diiorio@live.it) (R. Di Iorio).

## A B S T R A C T

These guidelines provide an up-date of previous IFCN report on “Non-invasive electrical and magnetic stimulation of the brain, spinal cord and roots: basic principles and procedures for routine clinical application” (Rossini et al., 1994). A new Committee, composed of international experts, some of whom were in the panel of the 1994 “Report”, was selected to produce a current state-of-the-art review of non-invasive stimulation both for clinical application and research in neuroscience.

Since 1994, the international scientific community has seen a rapid increase in non-invasive brain stimulation in studying cognition, brain–behavior relationship and pathophysiology of various neurologic and psychiatric disorders. New paradigms of stimulation and new techniques have been developed. Furthermore, a large number of studies and clinical trials have demonstrated potential therapeutic applications of non-invasive brain stimulation, especially for TMS. Recent guidelines can be found in the literature covering specific aspects of non-invasive brain stimulation, such as safety (Rossi et al., 2009), methodology (Groppa et al., 2012) and therapeutic applications (Lefaucheur et al., 2014).

This up-dated review covers theoretical, physiological and practical aspects of non-invasive stimulation of brain, spinal cord, nerve roots and peripheral nerves in the light of more updated knowledge, and include some recent extensions and developments.

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