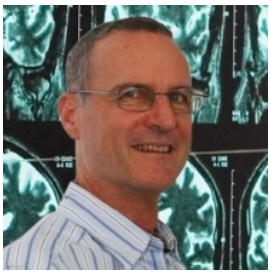

GARY WILLIAM THICKBROOM | BSc | MSc | PhD |

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RESUMÉ

Professor Thickbroom heads the Brain Plasticity Group at the Western Australian Neuroscience Research Institute and Centre for Neuromuscular and Neurological Disorders, University of Western Australia.

He is best known for his work with non-invasive brain stimulation (particularly transcranial magnetic stimulation) to study brain plasticity in people living with a neurological disorder, and in studies of basic motor cortex physiology in control populations.

Cortical mapping software that he developed revealed clinically relevant brain plasticity in stroke, cerebral palsy, multiple sclerosis, dystonia and Parkinson's disease. This highlighted the ubiquity and importance of central reorganisation in acute and progressive pathologies. In controls, adaptive plasticity was shown after fatiguing muscle exercise and motor learning.

He has developed novel and effective brain stimulation methodologies to modulate synaptic excitability (potentiation and depression) founded on an appreciation of motor cortex physiology. This involves multi-pulse sequences that follow the temporal dynamics of excitatory synaptic transmission, while accounting for cortical inhibition and disinhibition.

Circa 1998 he established functional magnetic resonance imaging (fMRI) at the Department of Radiology, Sir Charles Gairdner Hospital, using software for image processing and analysis he wrote for this purpose. He developed protocols for imaging cortical activity associated with motor tasks, muscle fatigue, and language (expressive and receptive), and has supervised over 100 studies of motor, visual, auditory and language executive function as part of pre-surgical planning.

He has 117 peer-reviewed publications, a mean of 24 citations per paper, and a h-index of 31 (source: Web of Science)

Future directions

- Augmenting rehabilitation programs with brain stimulation for people with neurological disorders.
- Neuromodulation (with brain stimulation) for the modification of higher order functions, such as cognition, memory and language.
- The effects of physical exercise and lifestyle on brain plasticity and function.
- The ongoing potential of functional neuroimaging and other imaging technologies in studies of cortical function.

ACADEMIC

2009-

Professor, Faculty of Medicine, Dentistry and Health Sciences, University of Western Australia.

2003

Associate Professor, Faculty of Medicine and Dentistry, University of Western

Australia.

2001

Adjunct Associate Professor, University of Western Australia

1988

PhD: "Presaccadic potentials: Topography and sources", Department of Medicine, University of Western Australia.

1980

MSc (by thesis): "Electrophysiological tests of the visual system and applications in Multiple Sclerosis", Department of Physics, University of Western Australia.

1975

BSc(Hons): Physics/Mathematics double major, Department of Physics, University of Western Australia. Grade A for all subjects in years 1-3, 2A Honours year 4.

1972

Western Australian General Exhibition award. A General Exhibition is awarded to the 20 students with the highest aggregate university-entrance score (7th position).

PROFILE

Visiting scientist

Burke Medical Research Institute, NY
Sobel Institute of Neurology, London
Human Movement and Balance Unit, Queen Square, London
National Institutes for Health, Bethesda, USA

Invited speaker

Institute of Movement Neuroscience, London
Clinical Neurophysiology Workshop, Gold Coast
Australian Association of Neurologists, Perth
Australian Society for Medial Research, Glenelg
Society for Western Australian Neuroscience, Perth
Australian Neurophysiology Technicians Association Annual Meeting, Perth
Neurophysiology Workshop, Australian Association of Neurologists, Southport
International Symposium on Transcranial Magnetic Stimulation, Gottingen, Germany

Invited lecturer

Department of Electrical and Electronic Engineering, University of WA
Department of Medicine, University of WA
Institute for Child Health Research
Australian Research Centre for Medical Engineering,
Department of Psychology, University of WA,
Department of Medical Technology and Physics, Sir Charles Gairdner Hospital.
Department of Neurosurgery, Sir Charles Gairdner Hospital
Department of Radiology, Sir Charles Gairdner Hospital.

Peer review

Member, Editorial Board, Clinical Neurophysiology (2005-2008)
Invited reviewer for manuscripts submitted to over 30 international peer-reviewed journals, including:

- Nature Medicine
- Brain
- Annals of Neurology
- Cerebral Cortex

- Neuroimage
- Human Brain Mapping
- Brain Stimulation
- Journal of Physiology
- Journal of Neuro-physiology
- Clinical Neurophysiology
- Journal of Applied Physiology
- Journal of Neurology
- Movement Disorders

Collaborations

A/Professor D Edwards, Cornell University and Harvard medical School: Brain stimulation, robotics and neurorehabilitation
Professor U Ziemann, University of Frankfurt: Interventional TMS
Professor J Rothwell, Institute of Neurology, London: Interventional TMS
Dr P Sacco, University of East London: TMS mapping and pain
Professor G Hammond, University of Western Australia: TMS and motor dominance

STUDENT SUPERVISION

PhD

K Makowiecki (2012-) Characterising the effects of pulsed magnetic fields in normal and abnormal brains: consequences of altered intracellular calcium levels and timecourse of events.
J Stewart (2009-) Corticomotor excitability and cerebral dominance.
WP Teo (2009-2012) Exploring the limits of human motor control in healthy subjects and patient's with Parkinson's disease
L G Johnson (2006-12) An investigation into the postural control and balance in people with Parkinson's disease and possible therapeutic approaches to improve postural instability and balance confidence.
L Murray (2005-11) Interventional TMS: temporal dynamics.
R F H Cash (2007-11) Timing-dependent mechanisms of cortical plasticity.
D Faulkner (2001-2008) Motor dexterity in stroke.
N Benwell (2003-2006) 'Inhibitory mechanisms of central fatigue'. Passed with disctinction.
D J Edwards (2002-2005) 'Effect of passive movement on human corticomotor excitability".
A J Pearce (1996-2000) 'Neurophysiology of cortical motor pathways during motor tasks'.
S A Wilson (1992-1994) 'TMS mapping of human motor cortex'.

MSc

M Tarran (B Med Sci: 2012-) 'Homeostatic plasticity in motor cortex'.
Dr T Redman, MBBS, (2005) 'Cerebral palsy – central changes with treatment'.

Honours

Kelly Munro (2013) Charles Darwin University "The effect of acute aerobic exercise on brain plasticity"
Alison Barnes (2009) University of Western Australia, Engineering "Development of a robotic dexterity device"
M Brady (2008) Curtin University, 'Neuroplasticity with ageing'. First class. Australian Physiotherapy Foundation Prize for the Honours student awarded the highest dissertation mark.
L Che (2008) Edith Cowan University, 'Corticomotor excitability with active and passive movement'. First class.
E Kang (2003) University of Western Australia, 'Cortical control of bilateral hand

movement'
R Smans (2003) University of Western Australia, 'Neuroimaging of stuttering'
N Benwell (2002) Central mechanisms of fatigue. Awarded first-class high distinction
D Edwards (2000-2001) Curtin University 'The effects of passive limb movement on corticomotor excitability'. Awarded, first-class.
R Sammut (1993) University of Western Australia 'Transcranial magnetic stimulation of human motor cortex: muscle responses in the lower limb'.

Medical Students

Taggart, Foo, Lem (2013-14) Modulating plasticity in human somatosensory cortex.
Cruice, Foster, Ross (2013) The effects of peripheral direct current stimulation on compound muscle action potentials and conduction velocity in the ulnar nerve.
Fiori, Chen, Kovacs (2013) Corticomotor excitability to the lower limb with spinal transcutaneous direct current stimulation.
Hudson, Samar, Lih (2012) The effect of a constant low-level magnetic field over a peripheral nerve on corticomotor excitability.
Van der Linden, Kelly, Flynn (2012) Effects of static magnets on working memory.
Patterson, Pevcic, Windnagel (2011) Effects of moderate intensity static magnetic fields on corticospinal excitability. Included a study of relative frequency and threshold tracking methods for determining motor threshold.
Chin (2010) Electromagnetic bursting following the cortical silent period induced by TMS
Silbert, Gibbons (2009) Modulating cortical plasticity during a motor task Riaz (2008) The effects of map size variations in determining an accurate centre site in TMS mapping.

Postgraduate examiner

PhD (University of Melbourne, 2013)
PhD (Adelaide University, 2012)
PhD (Adelaide University, 2009)
Hons (Curtin University, 2006)
AMS (University of Melbourne, 2006)
Hons (Curtin University, 2004)
PhD (Edith Cowan University, 2003)
MSc (Swinburne University of Technology, 2003)
PhD (University of Auckland, 2003)
PhD (University of Sydney, 2002)
MSc (University of Auckland, 2001)

RESEARCH GRANTS

2014 Requested (2015-7) National Health and Medical Research Council. $760,000. Modulating brain plasticity with non-invasive brain stimulation can augment motor rehabilitation after stroke

2014 University of Western Australia NHMRC near-miss award. $70,000. Modulating brain plasticity with non-invasive brain stimulation can augment motor rehabilitation after stroke

2014 Neurotrauma Research Program. $76,995. Augmenting Stroke Rehabilitation with Non-invasive Brain Stimulation

2013-2017 National Institutes of Health, USA. Transcranial Direct Current Stimulation and upper limb robotic therapy in rehabilitation after stroke (consulting investigator)

2008-2010 Neurotrauma Research Program. $75,000. A comparison of non-invasive interventions to maximise plasticity in the brain

2007-2009 Neurotrauma Research Program. $67,000. Using magnetic brain

stimulation to help recovery after spinal cord injury

2005-2006 Neurotrauma Research Program. $53,000. Can interventional brain stimulation improve motor performance after stroke?

2002-2003 Neurotrauma Research Program. $50,000. Neural reorganisation and recovery of function after brain injury and motor cortex lesions.

2001-2003 National Health and Medical Research Council of Australia. $363,000. Neurophysiological basis for sensorimotor interventions in rehabilitation after stroke.

2001 Medical Research Fund of Western Australia. $35,000. Traumatic Brain Injury: physiological studies of the corticomotor pathways.

1998-2000 National Health and Medical Research Council of Australia. $157,824. Reorganisation of cortical motor centres following recovery from ischaemic stroke.

1998-1999 Medical Research Fund of Western Australia. $70,000. Physiological studies of motor recovery following brain injury early in life.

1995-1997 National Health and Medical Research Council of Australia. $109,179. Physiological correlates of recovery after ischaemic strokes involving the pyramidal pathway.

1993-1994 Medical Research Fund of Western Australia. $50,000. Physiological studies of the motor cortex in dystonia.

1993 Parkinson's Association, $3,000. Quantitative assessment of motor function in Parkinson's disease.

1990-1993 Neuromuscular Foundation. $100,000. Establish the Brain Research Laboratory.

RESEARCH PAPERS

2014

112. Cash RFH, Murakami T, Chen R, Thickbroom GW, Ziemann U (2014) Augmenting plasticity-induction in human motor cortex by disinhibition stimulation (DIS). *Cerebral Cortex* doi: 10.1093/cercor/bhu176

111. Teo W-P, Rodrigues JP, Mastaglia FL, Thickbroom GW (2014) Modulation of corticomotor excitability after maximal or sustainable-rate repetitive finger movement is impaired in Parkinson's disease and is reversed by levodopa. *Clinical Neurophysiology* 125: 562-8. doi: 10.1016/j.clinph.2013.09.004.

110. Edwards DJ, Dipietro L, Demirtas-Tatlidede A, Medeiros AH, Thickbroom GW, Mastaglia FL, Krebs HI, Pascual-Leone A (2014) Movement-generated afference paired with transcranial magnetic stimulation: an associative stimulation paradigm. *Journal of NeuroEngineering and Rehabilitation* 11:31 doi: 10.1186/1743-0003-11-31.

109. Edwards DJ, Cortes M, Thickbroom GW, Rykman A, Pascual-Leone A, Volpe B (2014) Evidence against volume conduction to explain normal MEPs in muscles with low motor power in SCI. *Spinal Cord* doi: 10.1038/sc.2014.117

108. Silbert BI, Heaton A, Cash RFH, Dunne JW, Lawn ND, Silbert PL, Mastaglia FL, Thickbroom GW (2014) Evidence for an excitatory $GABA_A$ response in human motor cortex in idiopathic generalised epilepsy. *Epilepsia* (under revision)

107. Thickbroom GW, Cortes M, Rykman A, Volpe B, Fregni F, Krebs HI, Pascual-Leone A, Edwards DJ (2014) Stroke subtype and motor impairment influence contralesional excitability. *Annals of Clinical and Translational Neurology* (in review).

106. Stewart J, Thickbroom GW, Hammond G (2014) The effect of the preparation of bimanual forces of unequal and equal magnitude on corticomotor excitability.

Brain Stimulation (in review).

2013

105. Teo W-P, Rodrigues JP, Mastaglia FL, Thickbroom GW (2013) Comparing kinematic changes between a finger-tapping task and unconstrained finger flexion-extension task in patients with Parkinson's disease. *Experimental Brain Research* 227(3): 323-31. doi: 10.1007/s00221-013-3491-7

104. Silbert BI, Thickbroom GW (2013) Conditioning the cortical silent period with paired transcranial magnetic stimulation. *Brain Stimulation* 6(4): 541-544. doi: 10.1016/j.brs.2012.09.011

103. Silbert BI, Pevcic DD, Patterson HI, Windnagel KA, Thickbroom GW (2013) Inverse correlation between resting motor threshold and corticomotor excitability after static magnetic stimulation of human motor cortex. *Brain Stimulation* 6(5): 817-20. doi:10.1016/j.brs.2013.03.007

102. Silbert BI, Patterson HI, Pevcic DD, Windnagel KA, Thickbroom GW (2013) A comparison of relative-frequency and threshold-hunting methods to determine stimulus intensity in transcranial magnetic stimulation. *Clinical Neurophysiology* 124(4): 708-12. doi: 10.1016/j.clinph.2012.09.018

101. Schabrun SM, Chipchase LS, Zipf N, Thickbroom GW, Hodges PW (2013) Interaction between simultaneously applied neuromodulatory interventions in humans. *Brain Stimulation* 6(4): 624-30. doi: 10.1016/j.brs.2012.09.009

100. Johnson L, James I, Rodrigues JP, Stell R, Thickbroom GW, Mastaglia FL (2013) Clinical and posturographic correlates of falling in Parkinson's disease. *Movement Disorders* 28(9): 1250-6. doi: 10.1002/mds.25449

99. Johnson L, Stell R, Thickbroom GW, Mastaglia FL (2013) The effects of a supervised Pilates training program on balance in Parkinson's disease. *Advances in Parkinson's Disease* 2(2): 58-61. doi: 10.4236/apd.2013.22011

98. Giacobbe V, Krebs HI, Volpe BT, Pascual-Leone A, Rykman A, Zeierati G, Fregni F, Dipietro L, Thickbroom GW, Edwards DJ (2013) Transcranial direct current stimulation (tDCS) and robotic practice in chronic stroke: The dimension of timing. *NeuroRehabilitation* 33(1): 49-56. doi: 10.3233/NRE-130927

97. Edwards DJ, Cortes M, Thickbroom GW, Rykman A, Pascual-Leone A, Volpe BT (2013) Preserved corticospinal conduction without voluntary movement after spinal cord injury. *Nature Spinal Cord* 51(10): 765-7. doi: 10.1038/sc.2013.74. Comment: Wyndaele (2013) Residual pathways after SCI are not always clinically assessed. *Nature Spinal Cord* (2013) 51(10): 727. doi: 10.1038/sc.2013.114.

96. Cortes M. Elder J, Rykman A, Murray L, Avedissian M, Stampa A, Thickbroom GW, Pascual-Leone A, Krebs HI, Valls-Sole J, Edwards DJ (2013) Improved motor performance in chronic spinal cord injury following upper-limb robotic training. *NeuroRehabilitation* 33(1): 57-65. doi: 10.3233/NRE-130928

95. Cash RFH, Mastaglia FL, Thickbroom GW (2013) Evidence for high-fidelity timing-dependent synaptic plasticity of human motor cortex. *Journal of Neurophysiology* 109(1): 106-12. doi: 10.1152/jn.00584.2011

2012

94. Chin O, Cash RHF, Mastaglia FL, Thickbroom GW (2012) Electromyographic bursting following the cortical silent period induced by transcranial magnetic stimulation. *Brain Research* 1446: 40-5. doi: 10.1016/j.brainres.2012.01.041

93. Teo WP, Rodrigues JP, Mastaglia FL, Thickbroom GW (2012) Post-exercise depression in corticomotor excitability after dynamic movement: a general

property of fatiguing and non-fatiguing exercise. *Experimental Brain Research* 216(1): 41-9. doi: 10.1007/s00221-011-2906-6

92. Teo WP, Rodrigues JP, Mastaglia FL, Thickbroom GW (2012) Changes in corticomotor excitability and inhibition after exercise are influenced by hand dominance and motor demand. *Neuroscience* 210: 110-7. doi: 10.1016/j.neuroscience.2012.03.021

91. Teo WP, Rodrigues JP, Mastaglia FL, Thickbroom GW (2012) Breakdown in central motor control can be attenuated by motor practice and neuro-modulation of the primary motor cortex. *Neuroscience* 220: 11-8. doi: 10.1016/j.neuroscience.2012.06.048

2011

90. Cash RHF, Ziemann U, Thickbroom GW (2011) Inhibitory and disinhibitory effects on I-wave facilitation in motor cortex. *Journal of Neurophysiology* 105(1): 100-6. doi: 10.1152/jn.00650.2010

89. Murray, L, Nosaka, K, Thickbroom, GW (2011) Interventional repetitive I-wave transcranial magnetic stimulation (TMS): The dimension of stimulation duration. *Brain Stimulation* 4(4): 261-5. doi: 10.1016/j.brs.2010.12.003

88. Silbert BI, Gibbons JT, Cash RHF, Mastaglia FL, Thickbroom GW (2011) Modulation of corticomotor excitability by an I-wave intervention delivered during low-level voluntary contraction. *Experimental Brain Research* 208(2): 229-35. doi: 10.1007/s00221-010-2473-2

87. Thickbroom GW (2011) A model of the contribution of late I-waves to alpha-motoneuronal activation: implications for paired-pulse TMS. *Brain Stimulation* 4(2): 77-83. doi: 10.1016/j.brs.2010.04.002

86. Giacobbe V, Volpe BT, Thickbroom GW, Fregni F, Pascual-Leone A, Krebs HI, Edwards DJ. (2011) Reversal of TMS-induced motor twitch by training is associated with a reduction in excitability of the antagonist muscle. *Journal of Neuro-Engineering and Rehabilitation* 8: 46. doi: 10.1186/1743-0003-8-46

85. Cortes M, Thickbroom GW, Valls-Sole J, Pascual-Leone A, Edwards DJ (2011) Spinal associative stimulation: a non-invasive stimulation paradigm to modulate spinal excitability. *Clinical Neurophysiology* 122(11): 2254-9. doi: 10.1016/j.clinph.2011.02.038

2010

84. Cash RHF, Ziemann U, Murray K, Thickbroom GW (2010) Late cortical disinhibition in human motor cortex: A triple-pulse transcranial magnetic stimulation study. *Journal of Neurophysiology* 103(1): 511-8. doi: 10.1152/jn.00782.2009

83. Chye L, Nosaka K, Murray L, Edwards DJ, Thickbroom GW (2010) Corticomotor excitability of wrist flexor and extensor muscles during active and passive movement. *Human Movement Science* 29(4): 494-501. doi: 10.1016/j.humov.2010.03.003

2009

82. Sacco P, Turner D, Rothwell JC, Thickbroom GW (2009) Corticomotor responses to triple-pulse magnetic stimulation: effects of interstimulus interval and stimulus intensity. *Brain Stimulation* 2(1): 36-40. doi: 10.1016/j.brs.2008.06.255

81. Cash RF, Benwell NM, Murray K, Mastaglia FL, Thickbroom GW (2009). Neuromodulation by paired-pulse TMS at an I-wave interval facilitates multiple I-waves. *Experimental Brain Research* 103(1): 511-8. doi: 10.1152/jn.00782.2009

80. Rodrigues JP, Mastaglia FL, Thickbroom GW (2009) Rapid slowing of maximal finger movement rate: Fatigue of central motor control? *Experimental Brain Research* 196(4): 557-63. doi: 10.1007/s00221-009-1886-2

79. Edwards DJ, Krebs HI, Rykman a, Zipse J, Thickbroom GW, Mastaglia FL, Pascual-Leone A, Volpe B. (2009) Raised corticomotor excitability of M1 forearm area following anodal TDCS is sustained during robotic wrist therapy in chronic stroke. *Restorative Neurology and Neuroscience* 27(3): 199-207. doi: 10.3233/RNN-2009-0470

78. Johnson LGB, Colyer KE, Edwards DJ, Philippe DL, Eastwood PR, Walters S, Thickbroom GW, Mastaglia FL (2009) Improvement in aerobic capacity after an exercise program in sporadic inclusion body myositis (IBM). *Journal of Clinical Neuromuscular Disease* 10(4): 178-84 doi: 10.1097/CND.0b013e3181a23c86

2008

77. Thickbroom GW, Sacco P, Faulkner DL, Kermode AG, Mastaglia FL (2008) Enhanced corticomotor excitability with dynamic fatiguing exercise of the lower limb in multiple sclerosis. *Journal of Neurology* 255(7): 1001-5. doi: 10.1007/s00415-008-0818-6

76. Redman TA, Gibson N, Finn J, Bremner A, Valentine J, Thickbroom GW (2008) Upper limb corticomotor projections and physiological changes that occur with Botulinum Toxin-A therapy in children with hemiplegic cerebral palsy. *European Journal of Neurology* 15(8): 787-91. doi: 10.1111/j.1468-1331.2008.02194.x

75. Rodrigues JP, Walters SE, Stell R, Mastaglia FL, Thickbroom GW (2008) Spike-timing-related plasticity is preserved in Parkinson's disease and is enhanced by dopamine: Evidence from transcranial magnetic stimulation. *Neuroscience Letters* 448(1): 29-32. doi: 10.1016/j.neulet.2008.10.048

2007

74. Benwell NM, Mastaglia FL, Thickbroom GW (2007) Differential changes in long-interval intracortical inhibition and silent period duration during fatiguing exercise. *Experimental Brain Research* 179(2): 255-62. doi: 10.1007/s00221-006-0790-2

73. Dundas JE, Thickbroom GW, Mastaglia FL (2007) Perception of comfort during transcranial DC stimulation: Effect of NaCl solution concentration applied to sponge electrodes. *Clinical Neurophysiology* 118(5): 1166-70. doi: 10.1016/j.clinph.2007.01.010

72. Di Lazzaro V, Thickbroom GW, Pilato F, Profice P, Dileone M, Mazzone P, Insola A, Ranieri F, Tonali PA, Rothwell JC (2007) Direct demonstration of the effects of repetitive paired-pulse transcranial magnetic stimulation at I-wave periodicity. *Clinical Neurophysiology* 118(6): 1193-97. doi: 10.1016/j.clinph.2007.02.020

71. Johnson LGB, Edwards DJ, Walters S, Thickbroom GW, Mastaglia FL (2007) The effectiveness of an individualized, home-based functional exercise program for patients with sporadic Inclusion Body Myositis. *Journal of Clinical Neuromuscular Disease* 8(4):187-94. doi: 10.1097/cnd.0b013e3181237291

70. Benwell NM, Mastaglia FL, Thickbroom GW (2007) Changes in the functional MR signal in motor and non-motor areas during intermittent fatiguing hand exercise. *Experimental Brain Research* 182(1): 93-7. doi: 10.1007/s00221-007-0973-5

69. Edwards DJ, Mastaglia FL, Byrnes ML, Fregni F, Pascual-Leone A, Thickbroom GW (2007) Supraspinal inputs reduce corticomotor excitability during passive movement: evidence from a pure sensory stroke. *Restorative Neurology &*

Neuroscience 25(5-6): 527-33.

2006

68. Blacker D, Byrnes ML, Mastaglia FL, Thickbroom GW (2006) Differential activation of frontal lobe areas by lexical and semantic language tasks: an fMRI study. *Journal of Clinical Neuroscience* 13: 91-5. doi: 10.1016/j.jocn.2005.02.009
67. Thickbroom GW, Byrnes ML, Edwards DJ, Mastaglia FL (2006) Repetitive paired-pulse TMS at I-wave periodicity markedly increases corticomotor excitability: A new technique for modulating synaptic plasticity. *Clinical Neurophysiology* 117(1): 61-6. doi: 10.1016/j.clinph.2005.09.010
66. Thickbroom GW, Sacco P, Kermode AG, Archer SA, Byrnes ML, Guilfoyle A, Mastaglia FL (2006) Central motor drive and perception of effort during fatigue in multiple sclerosis. *Journal of Neurology* 253: 1048-53. doi: 10.1007/s00415-006-0159-2
65. Thickbroom GW, Byrnes ML, Walters S, Stell R, Mastaglia FL. (2006) Motor cortex reorganisation in Parkinson's disease. *Journal of Clinical Neuroscience* 13: 639-42. doi: 10.1016/j.jocn.2005.06.013
64. Benwell NM, Sacco P, Hammond GR, Byrnes ML, Mastaglia FL, Thickbroom GW. (2006) Short-interval cortical inhibition and corticomotor excitability with fatiguing hand exercise: a central adaptation to fatigue? *Experimental Brain Research* 170(2):191-8 doi: 10.1007/s00221-005-0195-7
63. Rodrigues JP, Edwards DJ, Walters S, Byrnes ML, Thickbroom GW, Stell R, Mastaglia FL (2006) A blinded placebo crossover study of Gabapentin in Primary Orthostatic Tremor. *Movement Disorders* 21: 900-5. doi: 10.1002/mds.20830
62. Benwell NM, Mastaglia FL, Thickbroom GW (2006) Reduced functional activation after fatiguing exercise is not confined to primary motor areas. *Experimental Brain Research* 17(4)5: 575-83. doi: 10.1007/s00221-006-0573-9
61. Benwell NM, Mastaglia FL, Thickbroom GW (2006) Paired-pulse rTMS at trans-synaptic intervals increases corticomotor excitability and reduces the rate of force loss during a fatiguing exercise of the hand. *Experimental Brain Research* 175(4): 626-32. doi: 10.1007/s00221-006-0579-3

2005

60. Thickbroom GW, Byrnes ML, Archer SA, Kermode, A, Mastaglia FL (2005) Corticomotor organisation and motor function in multiple sclerosis. *Journal of Neurology* 252(7): 765-71. doi: 10.1007/s00415-005-0728-9
59. Byrnes ML, Mastaglia FL, Walters SE, Archer SA, Thickbroom GW (2005) Primary writing tremor: motor cortex reorganisation and disinhibition. *Journal of Clinical Neuroscience* 12: 102-4.
58. Benwell NM, Byrnes ML, Mastaglia FL, Thickbroom GW (2005) Primary sensorimotor cortex activation with task-performance after fatiguing hand exercise. *Experimental Brain Research* 167(2): 160-4. doi: 10.1007/s00221-005-0013-2
57. Rodrigues JP, Edwards DJ, Walters S, Byrnes ML, Thickbroom GW, Stell R, Mastaglia FL (2005). Gabapentin can improve postural stability and quality of life in Primary Orthostatic Tremor. *Movement Disorders* 20(7): 865-70. doi: 10.1016/j.jocn.2004.08.004

2004

56. Thickbroom GW, Byrnes ML, Morris IT, Fallon MJ, Knuckey NW, Mastaglia FL (2004) Functional MRI near vascular anomalies: comparison of cavernoma and

arteriovenous malformation. *Journal of Clinical Neuroscience* 11(8): 845-8. doi: 10.1016/j.jocn.2003.10.016

55. Edwards DJ, Thickbroom GW, Byrnes ML, Ghosh S, Mastaglia FL (2004) Temporal aspects of passive movement-related corticomotor inhibition. *Human Movement Science* 23: 379-87. doi: 10.1016/j.humov.2004.08.013
54. Thickbroom GW, Byrnes ML, Archer SA, Mastaglia FL (2004) Motor outcome after subcortical stroke correlates with the degree of cortical reorganisation. *Clinical Neurophysiology* 115: 2144-50. doi: 10.1016/j.clinph.2004.04.001
53. Hammond G, Faulkner D, Byrnes ML, Mastaglia FL, Thickbroom GW (2004) Transcranial magnetic stimulation reveals asymmetrical efficacy of intracortical circuits in primary motor cortex. *Experimental Brain Research* 155: 19-23. doi: 10.1007/s00221-003-1696-x

2003

52. Thickbroom GW, Byrnes ML, Stell R, Mastaglia FL (2003) Reversible reorganisation of the cortical motor representation of the hand in cervical dystonia. *Movement Disorders* 18(4): 395-402. doi: 10.1002/mds.10383
51. Thickbroom GW, Byrnes ML, Mastaglia FL (2003) The dual representation of the hand in the cerebellum: activation with voluntary and passive movement. *Neuroimage* 18: 670-4. doi: 10.1016/S1053-8119(02)00055-1
50. Thickbroom GW, Byrnes ML, Blacker DJ, Morris IT, Mastaglia FL (2002) A functional MRI protocol for localizing language comprehension in the human brain. *Brain Research Protocols* 10: 175-80. doi: 10.1016/S1385-299X(02)00216-7

2002

49. Thickbroom GW, Byrnes ML, Archer SA, Mastaglia FL (2002) Motor outcome after subcortical stroke: MEPs correlate with hand strength but not dexterity. *Clinical Neurophysiology* 113: 2025-9. doi: 10.1016/S1388-2457(02)00318-8
48. Edwards DE, Thickbroom GW, Byrnes ML Ghosh S, Mastaglia FL (2002) Reduced corticomotor excitability with cyclic passive movement: a study using transcranial magnetic stimulation. *Human Movement Science* 21: 533-40. doi: 10.1016/S0167-9457(02)00169-0

2001

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