The Effect of Transcranial Magnetic Stimulation on Pain and Detection Thresholds in both Healthy Individuals and Individuals Suffering from Chronic Pain

by

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Submitted in fulfilment of the requirements for the degree of Doctor of Psychology

University of Tasmania

October 2009
I certify that this thesis contains no material which has been accepted for award of any other degree or diploma in any tertiary institution, except by way of background information where acknowledgement is made in the text of the thesis. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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ABSTRACT

Chronic pain is a complex phenomenon that is thought to affect between 17 and 22% of the Australian population. The complexities of chronic pain and the many different contributing factors to this condition, makes the relief of the symptomatic experience of pain difficult in many cases. Although there are a wide variety of treatment options available with varying degrees of invasiveness, often these options alone and in combination do not provide adequate pain relief for chronic pain sufferers.

There is some evidence that repetitive transcranial magnetic stimulation (rTMS) can alleviate the experience of chronic pain in individuals with medication-resistant chronic pain. The mechanisms by which rTMS may induce pain relief, however, are unknown. Consequently, there is a need to further explore the underlying mechanisms contributing to the analgesic effect that rTMS displays.

The present research examines the ability of TMS to directly influence peripheral sensations. The first two studies compared the effects of a single session of low frequency (1 Hz) TMS and high frequency (20 Hz) rTMS on thermal sensory thresholds in healthy individuals. High frequency rTMS was found to produce greater alterations in sensory thresholds than low frequency rTMS. A third study was carried out examining the effect of a single session of high frequency (20 Hz) rTMS on the sensory thresholds of individuals suffering from chronic pain and to measure rTMS-induced changes in their experience of pain.
Overall, this research revealed a limited degree of sensory alteration following low frequency rTMS in which only cold detection thresholds were significantly modified. High frequency rTMS, however, significantly altered cold detection and pain thresholds for healthy individuals, and cold detection, pain and heat pain thresholds were significantly altered for individuals suffering from chronic pain. In addition, individuals suffering from chronic pain reported a significant reduction in their experience of pain following high frequency rTMS.

The finding that rTMS can have a direct effect on sensory thresholds has implications for the therapeutic use of rTMS in the relief of chronic pain and provides scope for further investigation into the long-term effects of these alterations and the use of multiple sessions of rTMS in reducing the experience of chronic pain.
ACKNOWLEDGEMENTS

During the process of researching this thesis, there are a number of people who have provided their assistance and expertise in this area. Professor Jeff Summers, as my supervisor, has supported and guided me during the development and lengthy writing stage of this research. Professor Saxby Pridmore provided expertise and knowledge during the early stages of the project, and the provision of the necessary equipment to conduct this research was greatly appreciated. Thank you also to Dr Frances Martin who imparted valuable input during the writing-up process of this research, and Mike Garry for his statistical assistance.

On a personal note, during the last decade this research has taken to complete, there are some very special and important people in my life that I would like to thank for playing the crucial role they did in supporting and motivating me to finally complete this venture. Thank you to my (now) husband Rich, who has been by my side since the beginning of this project, providing endless support and encouragement to keep me going with it. To my parents, Linda and Andrew Johnson, my sister Misha Johnson, and my brother-in-law, Dane Bignell who have all been there emotionally, financially, and on a technical level during the writing phase of this thesis. These people have all uncomplainingly endured my mood swings, exasperation, irritability and frustration, and without them being there for me throughout this entire process, this thesis may never have reached an end point.
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