# A short critical evaluation of transcranial magnetic

Transcranial magnetic stimulation (TMS) has become a practical and effective technique in its use to study cognitive function (Jahanshahi & Rotherwell, 2000). It has been used to explore the motor-cortex, through its visible muscle twitch effect after stimulation, and primary visual pathways (Jahanshahi & Rotherwell; Beckers & Zeki, 1995). Through this exploration it was found that TMS can be used to create ‘ virtual lesions’ in the brain in which cortical processing is disrupted (Jahanshahi & Rotherwell). Thus, it is a valuable asset in identifying the roles of different parts of the brain in various tasks (Jahanshahi & Rotherwell).

However, there are methodological and procedural difficulties which need to be considered when using TMS. Besides creating electrical stimulation in the brain TMS has several ancillary effects which can distract participants from the tasks they perform and distort results (Jahanshahi & Rotherwell , 2000; Anand & Hotson, 2002). Eye blinking, tactile sensation on the scalp and a loud auditory click as the pulse is discharged, along with muscle twitches, which can become quiet pronounced, all confound results (Jahanshahi & Rotherwell; Anand & Hotson).

However, with ‘ anatomical’, task, time or sham controls implemented into the design these secondary effects can be controlled for (Anand & Hotson). In a ‘ control site’ design, the effects of TMS on one part of the cortical are compared when the coil delivering the electric pulse is moved and implemented on a control location which is predicted to have no effect (Jahanshahi & Rotherwell, 2000). However, by moving the coil to a different location, the ancillary effects can change (Aanand & Hotson, 2000).

For example, the effects of moving from the dorsolateral prefrontal cortex to the medial frontal cortex, as carried out in an experiment by Jahanshahi et al. (1998), could interfere as additional nerves and muscles may be activated (Jahanshahi & Rotherwell; Anand & Hotson). When task controls are implemented variation of tasks are used. Here, TMS is expected to produce an effect in the experimental task rather than in the control task (Jahanshahi & Rotherwell, 2000). However, determining and matching task difficulty, stimulus size and duration are limitations for this control (Anand & Hotson, 2002).

By altering the position of the coil so that only part of it is touching the skin, or by using a ‘ sham’ coil, which mimics the ancillary effects of TMS, a sham control is implemented (Anand & Hotson, 2002). However, as Loo et al. (2000) found, the choice of position for the sham TMS depends on the design of the study, as the criteria for an ‘ ideal sham’ was not met in any of the coil positions they investigated. As such, the placebo effect of sham TMS in previous studies may have been partially active (Loo et al. )