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[Intervention Review]

Transcranial magnetic stimulation for the treatment of obsessive-compulsive disorder

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ABSTRACT

Background

Transcranial magnetic stimulation (TMS) was introduced as a neurophysiological technique in 1985 when Anthony Barker and his team developed a compact machine that permitted non-invasive stimulation of the cerebral cortex (Barker 1985). Since its introduction, TMS has been used to evaluate the motor system, to study the function of several cerebral regions, and for the pathophysiology of several neuropsychiatric illnesses. In addition, it has been suggested that TMS might have therapeutic potential.

Some controlled studies have evaluated the effects of repetitive TMS (rTMS) in patients with obsessive-compulsive disorder (OCD). Greenberg (Greenberg 1997) observed that a single session of right prefrontal cortex stimulation produced a significant decrease in compulsive urges in OCD patients lasting over eight hours. Other studies have reported transitory improvements in mood but there are no observations for changes in anxiety or obsessions.

Objectives

To develop a systematic review on the clinical efficacy and safety of transcranial magnetic stimulation from randomised controlled trials in the treatment of obsessive-compulsive disorder.

Search methods

An electronic search was performed including the Cochrane Collaboration Depression, Anxiety and Neurosis Review Group trials register (last searched June, 2002), the Cochrane Controlled Trials Register (Issue 2, 2002), MEDLINE (1966-2002), EMBASE (1974-2002), PsycLIT (1980-2002), and bibliographies from reviewed articles.

Selection criteria

Randomised controlled trials assessing the therapeutic efficacy and safety of transcranial magnetic stimulation for obsessive-compulsive disorder.

Data collection and analysis

All reviewers independently extracted the information and verified it by cross-checking. Disagreements were resolved through discussion.

Main results

Three trials were included in the review and only two contained data in a suitable form for quantitative analysis. It was not possible to pool any results for a meta-analysis. No difference was seen between rTMS and sham TMS using the Yale-Brown Obsessive-Compulsive Scale or the Hamilton Depression Rating Scale for all time periods analysed.

Authors' conclusions

There are currently insufficient data from randomised controlled trials to draw any conclusions about the efficacy of transcranial magnetic stimulation in the treatment of obsessive-compulsive disorder.

PLAIN LANGUAGE SUMMARY

Transcranial magnetic stimulation (TMS) for the treatment of obsessive compulsive disorder (OCD)

Transcranial magnetic stimulation was introduced as neurophysiological technique in 1985 when Anthony Barker and his team developed a compact machine that permitted a non-invasive stimulation of the cerebral cortex. In addition it has been suggested that TMS could have therapeutic potential. Its' capability for excitation or inhibition of cortical areas in a non-invasive way represents a remarkable advance in neuroscience researches. Some studies have evaluated the therapeutic effects of repetitive TMS in controlled studies on patients with obsessive-compulsive disorder observing some changes in their behaviour in terms of compulsive urges or improvements in mood. This review has evaluated the current evidence for TMS as a therapeutic treatment for obsessive-compulsive disorder (OCD). There is a lack of evidence for the effect of TMS in the treatment of OCD.

BACKGROUND

Transcranial magnetic stimulation (TMS) was introduced as a neurophysiological technique in 1985 when Anthony Barker and his team developed a compact machine that permitted non-invasive stimulation of the cerebral cortex (Barker 1985). Since its introduction, TMS has been used to evaluate the motor system, to study the function of several regions of the brain, and to study the pathophysiology of several neuropsychiatric illnesses. However, it has also been suggested TMS could be used as a treatment.

Repetitive transcranial magnetic stimulation (rTMS) is a term used to describe the rhythmic and repetitive application of TMS. Stimulation faster than once per a second ($>1\text{Hz}$) is called high frequency rTMS, slower stimulation ($\leq 1\text{Hz}$) is called low frequency rTMS. Low frequency rTMS is thought to inhibit cortical stimulation in certain regions, while high frequency rTMS activates stimulated areas.

Some controlled studies have evaluated the therapeutic effects of rTMS in patients with obsessive-compulsive disorder (OCD). Greenberg (Greenberg 1997) observed that a single session of right prefrontal cortex stimulation produced a significant decrease in compulsive urges lasting over eight hours in OCD patients. Other studies have reported transitory improvements in mood but there are no observations for changes in anxiety or obsessive symptoms.

OCD is a chronic anxiety disorder (APA 1994). Typical symptoms include persistent and recurrent thoughts or mental images (that the sufferer realises are inappropriate), and compulsions taking the form of repetitive behaviours or mental acts in response to obsessions. Obsessions are often related to thoughts about contamination (from contact with other people or materials), and typical compulsions are cleaning, washing (e.g. hands), praying, counting, or checking the same things hundred of times in a pathological way.

OCD can seriously disrupt normal daily routine, leading to low quality of life, social impairment, and continuous mental distress (since sufferers know that their thoughts and behaviours are irrational). OCD has a prevalence of about two per cent. It has a chronic course, and often does not respond to conventional pharmacotherapy.

This systematic review aims to evaluate current evidence concerning transcranial magnetic stimulation technique as a therapeutic treatment for OCD.

OBJECTIVES

To develop a systematic review on the clinical efficacy and safety of the transcranial magnetic stimulation from randomised controlled trials in the treatment of obsessive-compulsive disorder.

METHODS

Criteria for considering studies for this review

Types of studies

All identified, relevant randomised controlled trials assessing the therapeutic efficacy and safety of transcranial magnetic

stimulation for obsessive-compulsive disorder were included. Quasi-randomised study designs were excluded.

Types of participants

All persons with obsessive-compulsive disorder diagnosed by any recognised criteria, irrespective of gender, age or nationality.

Types of interventions

A) The application of transcranial magnetic stimulation (TMS) versus:

1. No intervention.
2. Sham TMS.
3. Psychotherapy (sub-group analysis by different types of therapy).
4. Psychotropic drugs (sub-group analysis by different types of drugs).
5. Any other therapy (without drugs or psychotherapy).
6. (r)TMS + other therapies or drugs vs sham (r)TMS + the same therapies or drugs.

B) One technique of TMS versus another:

1. High frequency vs low frequency.
2. Right prefrontal cortex vs left prefrontal cortex.
3. Single pulse vs repetitive pulse.
4. Length of treatment (sub-group analysis by number of weeks).

Types of outcome measures

In this review the primary outcome was remission of symptoms, determined by any of the following measures: time to adjunctive treatment, readmission to hospital or hospital discharge, time off work or by appropriate psychometric scales.

Other outcomes with a clinical interest are:

- a) Functioning to short, medium and long term
- b) Individual / social behaviour
- c) Quality of life
- d) Global impression
- e) Acceptability of treatment (as measured by withdrawal from trial)
- f) Safety as measured by the incidence of adverse effects (including side-effects)
- g) Mortality.

Search methods for identification of studies

See: Collaborative Review Group search strategy.

The Cochrane Collaboration Depression, Anxiety and Neurosis Review Group's search strategy and the Iberoamerican Cochrane Centre search strategy were used to search MEDLINE (1966-2002), EMBASE (1974-2002), PsycLIT (1980-2002), the Cochrane Collaboration Depression, Anxiety and Neurosis Review Group trials register (last searched June, 2001), the Cochrane Controlled Trials Register (Issue 2, 2002). Date of last search in MEDLINE: 18 June 2002.

Electronic Searches

The following databases were searched using "Magnetic Stimulation" or rTMS or TMS

MEDLINE (1966-2002),

EMBASE (1974-2002), PsycLIT (1980-2002), the Cochrane Collaboration Depression, Neurosis and Anxiety Review Group trials register, the Cochrane Central Register of Controlled Trials (CENTRAL) (Issue 22, 2002).

Personal Communication;
Unpublished data and grey literature were searched through personal communications with researchers and others with an interest in the field.
When possible, the corresponding authors of identified RCTs were contacted for additional information about other relevant studies.

Handsearches;
Bibliographies of included studies were checked.

Data collection and analysis

Study selection

The reviewers independently evaluated all the identified articles without taking the results into consideration. Potentially relevant studies were identified from the references retrieved from the search. If the summary appeared relevant the complete text was obtained for an evaluation of its methodological quality.

Quality assessment

The quality of randomisation and allocation concealment for each trial was assessed using the methods described in the Cochrane Collaboration Handbook (Clarke 2001).

Data collection

All reviewers independently extracted the information and verified it with cross-checking. Disagreements were resolved through discussion.

Data synthesis

For cross-over studies we tried to exclude a possible carry-over effect between different phases by using only information from the first phase of such studies.

Incomplete data: it was agreed not to include studies with more than 40% withdrawals in the final quantitative analysis, as this level of withdrawal could threaten the validity of the results.

Continuous data: for continuous variables (psychometric test scores) the results of the individual studies were calculated as mean difference. For a pooled analysis, in the case of data becoming available in the future, the results will be calculated as weighted (or standardised) mean differences under a fixed effect model, weighted by the inverse variance method and with 95% confidence intervals (CIs). In the case of available binary data we will use the relative risk using a fixed effect model and the Mantel-Haenszel method with 95% CIs. If statistical heterogeneity is suspected, a random effects model (DerSimonian 1986) will be used. Statistical heterogeneity will be evaluated by an inspection of the graphs and chi-squared tests.

RESULTS

Description of studies

Only three trials that met our inclusion criteria were identified. One of the trials (Alonso 2001) used a double-blind, randomised,

placebo-controlled parallel groups design of six weeks' treatment plus four weeks follow-up. This trial included 18 outpatients who met DSM-IV criteria for OCD. Five of these patients were not taking any other medications and the rest had been taking a stable dose of medication for at least 12 weeks. The second trial (Sachdev 2001) compared right vs left prefrontal rTMS without a placebo arm in 12 OCD subjects. Patients received treatment for two weeks' treatment with an evaluation at one and two weeks and one month later. The third study (Greenberg 1997) used a randomised, double-blind, crossover design. It studied 12 OCD patients with an evaluation 12 hours after stimulation. This study has been excluded from the quantitative analysis of this review because data from the first phase of the trial were not available.

See: characteristics of included studies table.

Risk of bias in included studies

Randomisation and allocation concealment

The studies included in the statistical analysis of this review (Alonso 2001) (Sachdev 2001) have been included in category B, as they do not describe the method of concealment allocation used and only give a general description of randomisation.

Blinding of intervention

When administering TMS it is impossible to blind the person who administers the technique (i.e. the physician who applies the treatment or control) and double-blind therefore refers to the patient and outcome assessor.

Follow-up

In these two studies all subjects completed the protocol.

Effects of interventions

Low frequency rTMS over the right dorsolateral prefrontal cortex versus sham TMS.

Outcome: Remission of obsessions and/or compulsions.

1. Yale-Brown Obsessive Compulsive Scale (6 weeks). Only one study contributed to this analysis with data from 18 patients (10 in the treatment group and 8 in the placebo group). Sub-category analysis was carried out by obsessions, compulsions and total score. For obsessions, the mean difference (MD) for the rTMS versus sham TMS, was -2.10 (95% CI -5.82 to 1.62 $p = 0.3$). For compulsions the MD between rTMS and placebo was -0.90 (95% CI -6.27 to 4.47 $p = 0.7$). For total score, the MD for the rTMS versus sham TMS was -3.10 (95% CI -10.75 to 4.55; $p = 0.4$).

Yale-Brown Obsessive Compulsive Scale (10 weeks). The same study contributed to this analysis with data from 18 patients (10 in the treatment group and 8 in the placebo group). Sub-category analysis was carried out by obsessions, compulsions and total score. For obsessions, the mean difference (MD) for the rTMS versus sham TMS, was -3.00 (95% CI -7.01 to 1.01 $p = 0.14$). For compulsions the MD between rTMS and placebo was -1.30 (95% CI -6.51 to 3.91 $p = 0.6$). For total score, the MD for the rTMS versus sham TMS was -4.70 (95% CI -12.76 to 3.36 $p = 0.3$).

Outcome: Remission of depression.

1. Hamilton depression Rating Scale (6 weeks). Only one study contributed to this analysis with data from 18 patients (10 in the treatment group and 8 in the placebo group). For depression, the

mean difference (MD) for the rTMS versus sham TMS was -1.10 (95% CI -5.03 to 2.83 $p=0.6$).

Hamilton Depression Rating Scale (10 weeks). The same study contributed to this analysis with data from 18 patients (10 in the treatment group and 8 in the placebo group). The mean difference (MD) for the rTMS versus sham TMS was -1.20 (95% CI -4.83 to 2.43 $p=0.5$).

High frequency rTMS over the right dorsolateral prefrontal cortex versus left dorsolateral prefrontal cortex

Outcome: Remission of obsessions and/or compulsions.

1. Yale-Brown Obsessive Compulsive Scale (2 weeks treatment and 1 month follow-up). Only one study contributed to this analysis with data from 12 patients (6 in the treatment group and 6 in the placebo group). Sub-category analysis was carried out by obsessions, compulsions and total score. After two weeks, the mean difference (MD) for obsessions for right-rTMS versus left-rTMS, was 2.33 (95% CI -3.82 to 18.48 $p=0.5$). For compulsions the MD between right-rTMS versus left-rTMS was -2.00 (95% CI -8.45 to 4.45 $p=0.5$). For total score, the MD for right-rTMS versus left-rTMS was 0.33 (95% CI -10.26 to 10.92; $p=1$). At one month follow-up the MD for obsessions for right-rTMS versus left-rTMS, was -2.10 (95% CI -5.95 to 1.75 $p=0.3$). For compulsions the MD between right-rTMS versus left-rTMS was -2.40 (95% CI -6.87 to 2.07 $p=0.3$). For total score, the MD for right-rTMS versus left-rTMS was -4.50 (95% CI -11.86 to 2.86; $p=0.2$).

Outcome: Remission of depression.

1. Beck Depression Inventory (2 weeks treatment and 1 month follow-up). Only one study contributed to this analysis with data from 12 patients (6 in the treatment group and 6 in the placebo group). At two weeks the mean difference (MD) in depression for right-rTMS versus left-rTMS was 4.50 (95% CI -5.22 to 14.22 $p=0.4$). At one month follow-up the MD for depression for right-rTMS versus left-rTMS was 0.77 (95% CI -12.50 to 14.04 $p=0.9$).

2. Montgomery-Asberg Depression Rating Scale (2 weeks treatment and 1 month follow-up). Only one study contributed to this analysis with data from 12 patients (6 in the treatment group and 6 in the placebo group). At two weeks, the mean difference (MD) for depression for right-rTMS versus left-rTMS was 9.33 (95% CI -0.90 to 19.56 $p=0.07$). At one month follow-up the MD for right-rTMS versus left-rTMS, was 5.37 (95% CI -3.03 to 13.77 $p=0.2$).

Outcome: Remission of anxiety.

1. Spielberger State-Trait Anxiety Inventory-State (2 weeks treatment and 1 month follow-up). Only one study contributed to this analysis with data from 12 patients (6 in the treatment group and 6 in the placebo group). At two weeks the mean difference (MD) in anxiety for right-rTMS versus left-rTMS was 0.50 (95% CI -13.79 to 14.79 $p=0.9$). At one month follow-up the MD for anxiety for right-rTMS versus left-rTMS, was -0.83 (95% CI -19.10 to 17.44 $p=0.9$).

There were no statistically significant findings.

The evaluation of safety and adverse effects will be done in an update of this review as currently there are insufficient data available.

DISCUSSION

It is not possible to draw any conclusions from this review. Before the use of transcranial magnetic stimulation can be recommended for patients with obsessive compulsive disorder further large, randomised placebo-controlled trials are needed for its evaluation.

AUTHORS' CONCLUSIONS

Implications for practice

There is no reliable evidence on which to base a decision to use transcranial magnetic stimulation to treat patients with obsessive-compulsive disorder. It is not yet possible to recommend routine use of TMS for treating OCD.

Implications for research

There are currently insufficient data from randomised controlled trials to draw any conclusions about the efficacy of transcranial magnetic stimulation in the treatment of obsessive-compulsive disorder. Further large randomised-controlled trials are required to evaluate its efficacy

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Alonso 2001

Methods	Parallel randomised control-placebo double-blind 6 weeks treatment + four weeks follow-up post treatment	
Participants	Patients: Randomised: 18 Mean age: 35.27 (12.18). Women: 12 Men: 6	
Interventions	rTMS (110% of motor threshold) over right dorsolateral prefrontal cortex and low frequency versus sham TMS at 20% motor threshold.	
Outcomes	Yale-Brown Obsessive compulsive Scale. Hamilton Depression Rating Scale.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Greenberg 1997

Methods	Cross-over randomised double-blind	
Participants	Patients: Randomised: 12 Mean age: 36.9 (10.2). Women: 6 Men: 6	
Interventions	rTMS (80% motor threshold, 20 Hz/2 seconds per minute for 20 minutes) over right lateral prefrontal, left lateral prefrontal and mioccipital (as control) site.	
Outcomes	Yale-Brown Obsessive Compulsive Scale. Hamilton Depression Rating Scale. National Institute of Mental health Self-rating Scale.	
Notes		
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sachdev 2001

Methods	Parallel randomised right vs left double-blind
Participants	Patients: Randomised: 12 Mean age: 40.5 (13.4) Male: 9 Female: 3
Interventions	rTMS (10 Hz, 30 trains of 5 seconds each, 25 seconds between trains, and 110% resting motor threshold) over right dorsolateral prefrontal cortex and high frequency vs left dorsolateral prefrontal cortex and high frequency
Outcomes	Yale-Brown obsessive compulsive scale. Montgomery-Asberg Depression rating scale. Beck depression inventory. Spielberger state-trait anxiety inventory-state.
Notes	
Risk of bias	
Bias	Authors' judgement Support for judgement
Allocation concealment?	Unclear risk B - Unclear

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Greenberg 1998	12 patients and 12 healthy volunteers
Greenberg 2000	16 OCD patients and 11 age-matched healthy volunteers
Ziemann 1997	Tourette's disorder (patients and healthy subjects)

DATA AND ANALYSES

Comparison 1. Remission of obsessions and/or compulsions (rTMS vs placebo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Yale-Brown Obsessive Compulsive Scale (6 weeks)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 Obsessions	1	18	Mean Difference (IV, Fixed, 95% CI)	-2.10 [-5.82, 1.62]
1.2 Compulsions	1	18	Mean Difference (IV, Fixed, 95% CI)	-0.90 [-6.27, 4.47]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.3 Total	1	18	Mean Difference (IV, Fixed, 95% CI)	-3.10 [-10.75, 4.55]
2 Yale-Brown Obsessive Compulsive Scale (10 weeks)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 Obsessions	1	18	Mean Difference (IV, Fixed, 95% CI)	-3.0 [-7.01, 1.01]
2.2 Compulsions	1	18	Mean Difference (IV, Fixed, 95% CI)	-1.30 [-6.51, 3.91]
2.3 Total	1	18	Mean Difference (IV, Fixed, 95% CI)	-4.70 [-12.76, 3.36]

Analysis 1.1. Comparison 1 Remission of obsessions and/or compulsions (rTMS vs placebo), Outcome 1 Yale-Brown Obsessive Compulsive Scale (6 weeks).

Analysis 1.2. Comparison 1 Remission of obsessions and/or compulsions (rTMS vs placebo), Outcome 2 Yale-Brown Obsessive Compulsive Scale (10 weeks).

Comparison 2. Depression (rTMS vs placebo)

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Hamilton Depression Rating Scale (6 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	-1.10 [-5.03, 2.83]
2 Hamilton Depression Rating Scale (10 weeks)	1	18	Mean Difference (IV, Fixed, 95% CI)	-1.20 [-4.83, 2.43]

Analysis 2.1. Comparison 2 Depression (rTMS vs placebo), Outcome 1 Hamilton Depression Rating Scale (6 weeks).

Analysis 2.2. Comparison 2 Depression (rTMS vs placebo), Outcome 2 Hamilton Depression Rating Scale (10 weeks).

Comparison 3. Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Yale-Brown Obsessive Compulsive Scale (2 weeks)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
1.1 Obsessions	1	12	Mean Difference (IV, Fixed, 95% CI)	2.33 [-3.82, 8.48]
1.2 Compulsions	1	12	Mean Difference (IV, Fixed, 95% CI)	-2.0 [-8.45, 4.45]
1.3 Total	1	12	Mean Difference (IV, Fixed, 95% CI)	0.33 [-10.26, 10.92]
2 Yale-Brown Obsessive Compulsive Scale (1month follow-up)	1		Mean Difference (IV, Fixed, 95% CI)	Subtotals only
2.1 Obsessions	1	12	Mean Difference (IV, Fixed, 95% CI)	-2.10 [-5.95, 1.75]
2.2 Compulsions	1	12	Mean Difference (IV, Fixed, 95% CI)	-2.40 [-6.87, 2.07]
2.3 Total	1	12	Mean Difference (IV, Fixed, 95% CI)	-4.5 [-11.86, 2.86]
3 Beck Depression Inventory (2 weeks)	1	12	Mean Difference (IV, Fixed, 95% CI)	4.5 [-5.22, 14.22]
4 Beck Depression Inventory (1 month follow-up)	1	12	Mean Difference (IV, Fixed, 95% CI)	0.77 [-12.50, 14.04]
5 Montgomery-Asberg Depression Rating Scale (2 weeks)	1	12	Mean Difference (IV, Fixed, 95% CI)	9.33 [-0.90, 19.56]
6 Montgomery-Asberg Depression Rating Scale (1 month follow-up)	1	12	Mean Difference (IV, Fixed, 95% CI)	5.37 [-3.03, 13.77]
7 Spielberger State-Trait Anxiety Inventory-State (2 weeks)	1	12	Mean Difference (IV, Fixed, 95% CI)	0.5 [-13.79, 14.79]
8 Spielberger State-Trait Anxiety Inventory-State (1 month follow-up)	1	12	Mean Difference (IV, Fixed, 95% CI)	-0.83 [-19.10, 17.44]

Analysis 3.1. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 1 Yale-Brown Obsessive Compulsive Scale (2 weeks).

Analysis 3.2. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 2 Yale-Brown Obsessive Compulsive Scale (1month follow-up).

Analysis 3.3. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 3 Beck Depression Inventory (2 weeks).

Analysis 3.4. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 4 Beck Depression Inventory (1 month follow-up).

Analysis 3.5. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 5 Montgomery-Asberg Depression Rating Scale (2 weeks).

Analysis 3.6. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 6 Montgomery-Asberg Depression Rating Scale (1 month follow-up).

Analysis 3.7. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 7 Spielberger State-Trait Anxiety Inventory-State (2 weeks). **Analysis 3.8. Comparison 3 Right dorsolateral prefrontal cortex vs left dorsolateral prefrontal cortex, Outcome 8 Spielberger State-Trait Anxiety Inventory-State (1 month follow-up).** **WHAT'S NEW**

Date	Event	Description
6 November 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 3, 2001

Review first published: Issue 3, 2003

Date	Event	Description
5 December 2002	New citation required and conclusions have changed	Substantive amendment

CONTRIBUTIONS OF AUTHORS

JL - drafts of the review, methodological aspects and statistical aspects, correspondence

MBR - methodological aspects of review

VP and MS - clinical aspects of the review

DECLARATIONS OF INTEREST

None

SOURCES OF SUPPORT

Internal sources

- Institut de Recerca del Hospital de la Santa Creu i Sant Pau (Barcelona), Spain.
- Centro Cochrane Iberoamericano (Barcelona), Spain.
- Hospital de la Santa Creu i Sant Pau (Barcelona), Spain.
- Fundación para la Investigación Sanitaria en Castilla-La Mancha FISCAM (Toledo), Spain.

External sources

- Instituto de Salud Carlos III (Madrid), Spain.

NOTES

This review is in the process of being updated.

INDEX TERMS

Medical Subject Headings (MeSH)

Obsessive-Compulsive Disorder [*therapy]; Physical Stimulation [*methods]; Randomized Controlled Trials as Topic; Transcranial Magnetic Stimulation [*therapeutic use]

MeSH check words

Humans