

Vagus Nerve Stimulation (VNS) vs. Deep Brain Stimulation (DBS) Treatment for Major Depressive Disorder and Bipolar Depression: A Comparative Meta-analytic Review

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BACKGROUND

- Patients who suffer from major depressive episodes and bipolar disorder often exhibit pharmaco-resistance. Therefore, novel treatment methodologies are being proposed to treat the disease or provide symptomatic relief. VNS and DBS are two such techniques, both of which utilize neurostimulation to achieve therapeutic relief. However, it is necessary to establish the comparative efficacies of these methods in treating MDD in patients.

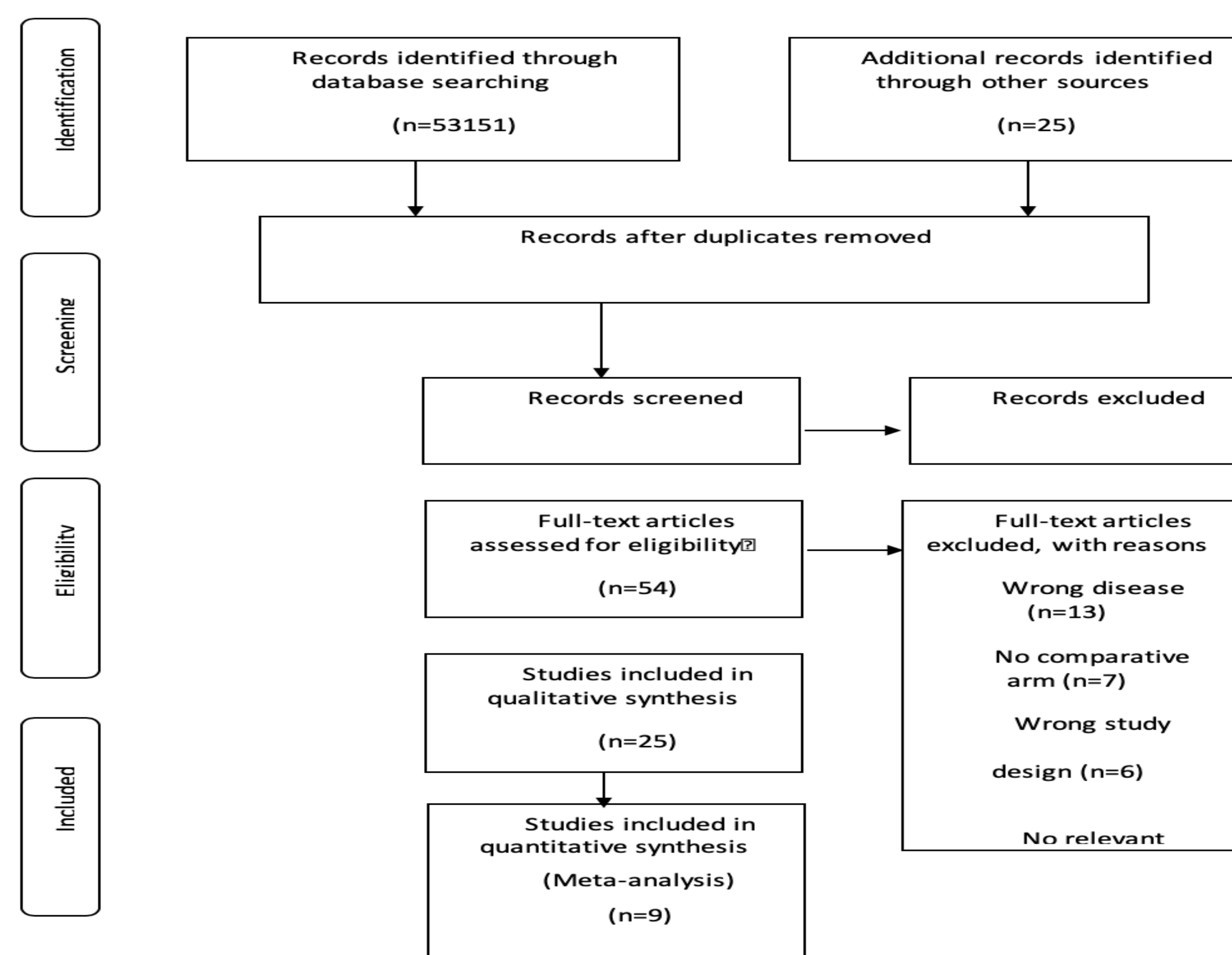
OBJECTIVES

- To assess the relative difference in the efficacy of VNS versus DBS for treatment of Major Depressive Disorder and bipolar depression and to provide evidence for the superior technique.

METHODS

- To compare the efficacy of VNS versus DBS for the reduction of depressive symptoms in patients who meet the criteria for a major depressive episode, we conducted a meta-analysis of studies of the subject.
- Twenty-six studies were selected, consisting of 1160 patients who were treated with either VNS (Mean age = 47.75 years old, mean duration of illness = 22.86 years) or DBS (Mean age = 33.11 years old, mean duration of illness = 9.9 years) treatment arms, and analyzed them to determine the amount of improvement in mood.
- The primary outcome measures were evaluated in terms of change between pre-test and post-test scores over a period of three months, as measured by HDRS and MADRS rating scales.

STUDY SELECTION PROCESS



INCLUSION AND EXCLUSION CRITERIA

- Inclusion Criteria**
 - Clinical research papers published in the English language.
 - Research papers involving only treatment-resistant depression.
 - Papers that contained clear descriptions of clinical outcomes utilizing validated outcome measures.
 - Studies reporting results of monotherapy and pre- and post-treatment scores.
 - Studies reporting treatment with respect to either/both Unipolar (MDD) and Bipolar Treatment-Resistant Depression.
- Exclusion Criteria**
 - Treatment procedures involving other methods of brain stimulation.
 - Treatment procedures treating DBS or VNS as adjunctive therapies.
 - Studies reporting patients with other mental illnesses such as bipolar illness—manic or rapid cyclic, schizoaffective disorders, or others

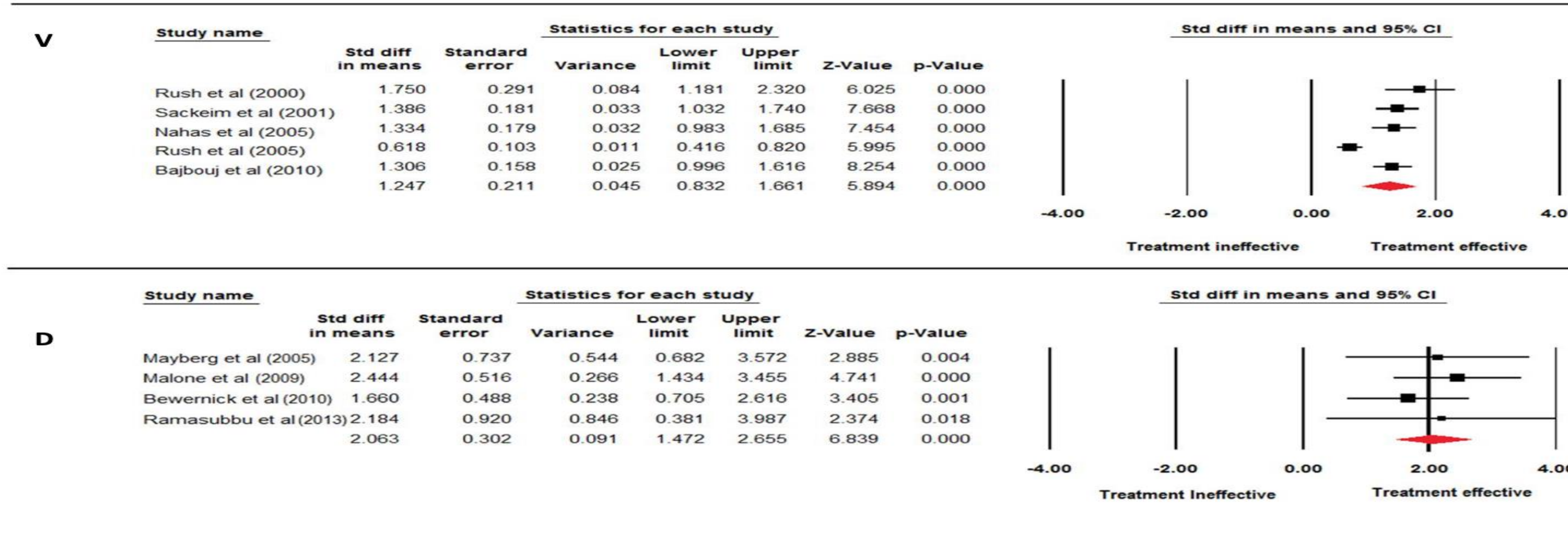


Figure 2: Forest plot for VNS and DBS treatment scores with respect to the HDRS rating scale

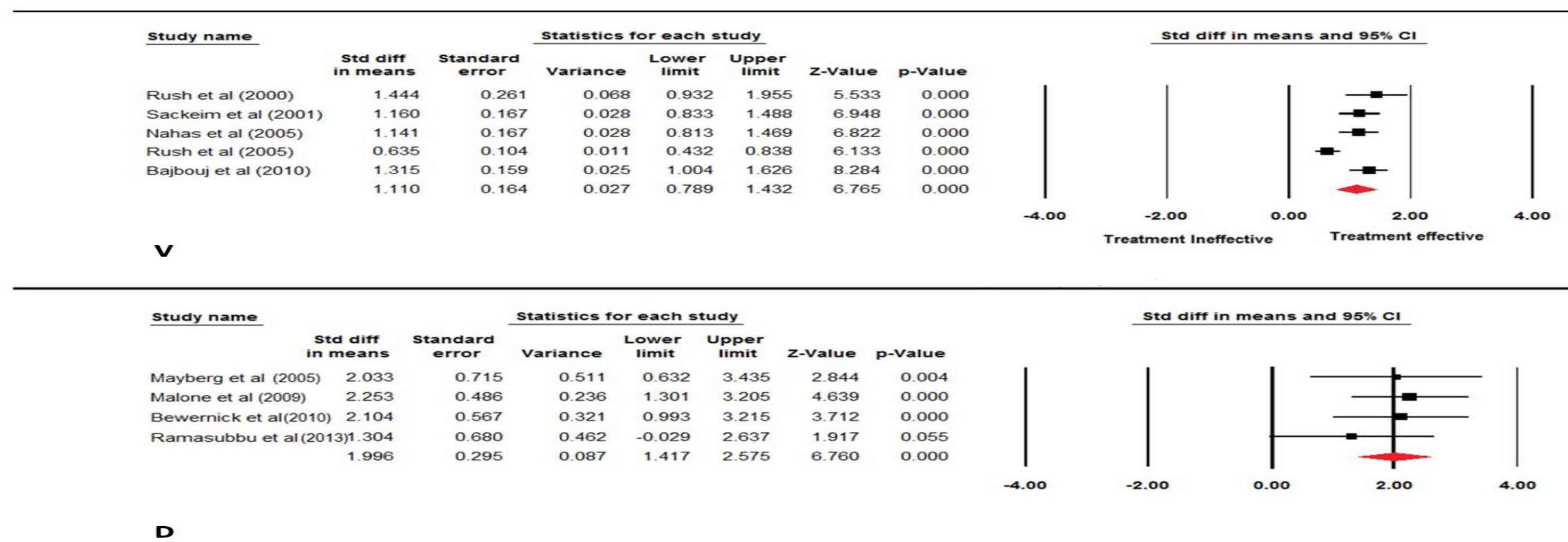


Figure 3: Forest plot for VNS and DBS treatment scores with respect to the MADRS rating scale

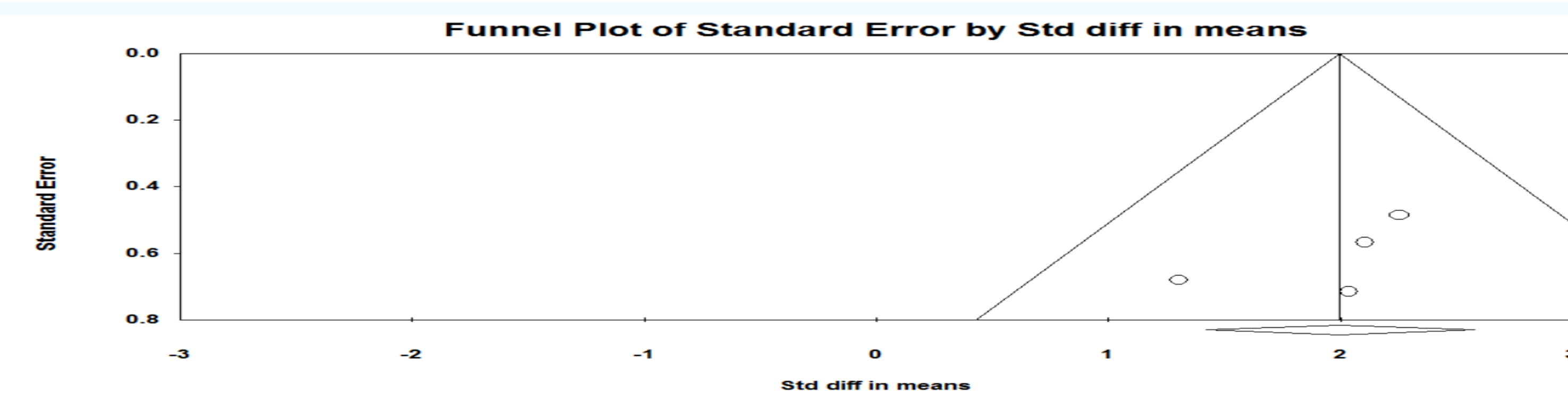


Figure 5: Funnel plot for DBS studies

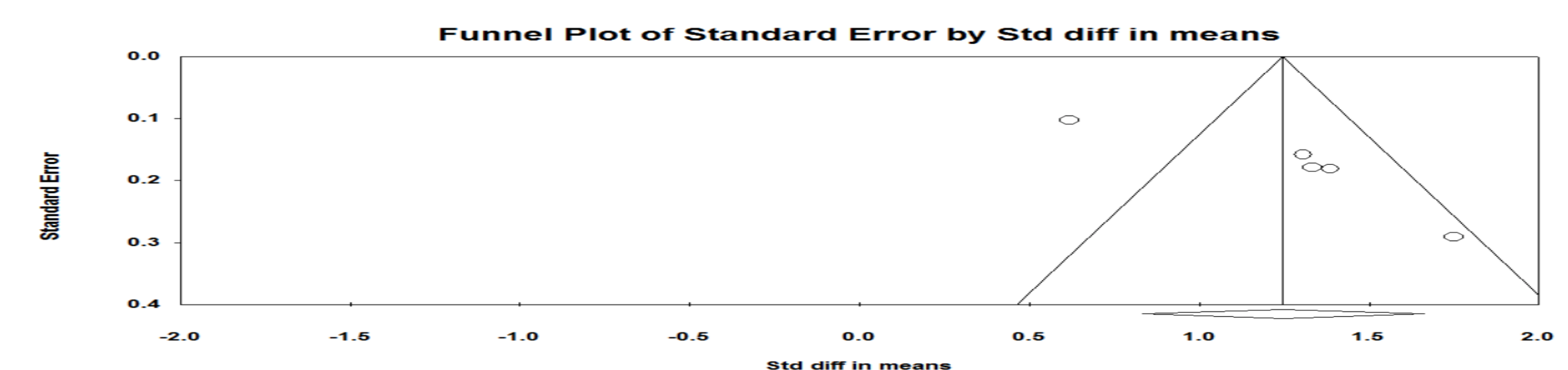


Figure 4: Funnel plot for VNS studies

RESULTS

- A comparison of the summary effect size produced by VNS (HDRS = 1.247, MADRS = 1.110) to that produced by DBS (HDRS = 2.063, MADRS = 1.996) seems to demonstrate that DBS is the more effective treatment.
- However, as the VNS and DBS groups differed in terms of the clinical profiles of the patients (both in terms of age and in terms of duration of the illness), it is not possible to conclusively determine which treatment is superior.

DISCUSSION

- Vagus Nerve Stimulation (VNS) and Deep Brain Stimulation (DBS) both involve electrical stimulation of the neural target via an implanted device (Christmas, Curran, Matthews, & Eljamel, 2009).
- The constant electrical stimulation results in the alteration of the activity of the targeted brain area; depending upon the location of the implant, these NTs have proven to be effective in bringing relief to patients suffering from MDD and bipolar depression (Osso et al., 2009).
- The present meta-analytic review has compared the relative efficacies of the two emerging neurostimulation treatment methodologies for depression, namely VNS and DBS.
- The comparison of the summary effect sizes showed the superiority of DBS over VNS in ameliorating depression.
- The results of the individual VNS and DBS meta-analyses has shown that these treatment methods indeed provide benefit, even in patients who previously exhibited high refractory responses with previous drug and ECT treatments.
- The foremost limitation is that the results generated from the present study could not be extrapolated to a general, large-scale population, as studies that were analyzed included research with very small sample sizes, especially the DBS studies. The clinical profile of patients in the VNS group and DBS group were very different in terms of age, duration of illness, and duration of follow up or intervention.
- Another limitation is that these techniques are relatively new in the domain of psychiatric procedures, and the complete implications are not yet known

CONCLUSION

- Deep Brain Stimulation (DBS) may or may not be more effective in improving the depressive state of patients, as compared to Vagus Nerve Stimulation (VNS).
- Research studies with larger, synchronous sample sizes and control groups are required for a meta-analysis to draw firmer conclusions. Studies which closer match participants on the basis of age, duration of illness, and duration of treatment will allow a better "head-to-head" comparison and thus provide stronger evidence for the superiority of one of the treatment methods.
- Therefore, additional controlled trails are necessary because they will provide evidence of higher credibility and facilitate more accurate comparisons.

References:

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