

## Risk of Bias Criteria

- i) **Deviations from the intended protocol:** Was blinding considered effective for participants and assessors? Were there issues in the methodology that suggest concerns with blinding? Was 'intention-to-treat' analysis implemented? Was 'per-protocol effect' adhered to? Did the protocol consider effective blinding? Did participants withdraw during treatment? Was a condition ceased early? Was there appropriate analysis to estimate the effect of assignment to conditions? Were deviations from the protocol balanced between groups? Were deviations of the protocol likely to have affected the outcome?
- ii) **Missing outcome data:** Were data for the primary outcome available for all, or nearly all participants randomized? Did missing data indicate that results were biased, i.e. do reasons for missing data differ between intervention groups or specifically relate to the condition? Could missing data depend on its true value? Was analysis conducted appropriately in accordance with missing data?
- iii) **Selection of reported results:** Was there selective reporting of a particular outcome measurement? Are the results likely selected from multiple analyses or multiple outcome measurements?

Each bias criteria was evaluated as:

**Low risk (✓):** if present, bias is unlikely to alter the results

**Unknown risk (?):** bias may be present, but it is not determined if it alters the results

**High risk (!):** bias may alter the results seriously

The overall risk of bias for each article was assessed as:

**Low:** low risk of bias for all criteria

**Some:** bias is present in one criterion, or unknown bias is present in two or more criteria

**High:** high risk of bias is present in two or more criteria, or some concerns for all criteria

## Risk of Bias Assessment

Study	i	Assessment	ii	Assessment	iii	Assessment	Overall assessment
<b>ECT Risk of Bias assessment</b>							
Maletzky 1994 (USA)	✓		✓		✓		Low
Tomruk et al., 2010 ((Turkey)	✓		✓		✓		Low
Liu et al., 2014 (China)	✓		✓		✓		Low
Manhas et al., 2016 (India)	✓		✓		✓		Low
Aggarwal et al., 2019 (India)	✓		✓		✓		Low
Das et al., 2019 (India)	✓		✓		✓		Low
Morais et al., 2007 (Brazil)	✓		✓		✓		Low
Dehning et al., 2011 (Germany)	✓		✓		✓		Low
Rajashree et al., 2014 (India)	✓		✓		✓		Low
Guo et al., 2016 (USA)	✓		✓		✓		Low
<b>tDCS risk of bias assessment</b>							
Bation et al., 2016 (France)	✓		✓		✓		Low
Dinn et al., 2016 (Turkey)	✓		✓		✓		Low
Klimke et al., 2016 (Germany)	✓		✓		✓		low
D'urso et al., 2016b (Italy)	?	2 switched from the anodal to cathodal condition	✓		!	Mean change per each condition not reported, statistics conducted on grouped conditions only.	Medium

Najafi et al., 2017 (Iran)	✓		✓	!	Statistical analysis does not provide meaningful results	Medium
Bation et al., 2019 (France)	?	Blinding not assessed	✓	✓		Low
Godwa et al., 2019 (France)	?	Group means for secondary outcomes not reported. Blinding not assessed.	✓	✓		Low
Kumar et al., 2019 (India)	✓		✓	✓		Low
Volpato et al., 2013 (Italy)	?	Blinding not assessed	✓	✓		Low
D'urso et al., 2016a (Italy)	✓		✓	✓		Low
Mondino et al., 2015 (France)	✓		✓	✓		Low
Narayanaswamy et al., 2015 (India)	✓		!	Follow up YBOCS not reported	✓	Medium
Alizadeh Goradel et al., 2016 (Iran)	✓		✓	✓		Low
Hazari et al., 2016 (India)	✓		✓	✓		Low
Silva et al., 2016 (Brazil)	?	Blinding not assessed	✓	✓		Low
Palm et al., 2017 (Germany)	✓		✓	✓		Low
Mrakic-Sposta et al. 2008 (Italy)	?	Blinding not assessed	✓	✓		Low
Carvalho et al., 2015 (India)	✓		✓	✓		Low
Eapen et al., 2017 (Australia)	?	Blinding not assessed	✓	!	YGTSS assessment in protocol, but not reported	Medium

#### TMS bias assessment

Alonso et al., 2001 (Spain)	?	Sham- 90 degree tilt method, possible neural effects. Blinding not assessed.	✓		!	Outcomes immediately post treatment not reported.	Medium
Sachdev et al., 2001 (Australia)	?	Sham method not reported. Blinding not assessed.	✓		✓		Low
Mantovani et al., 2006 (Italy)	!	Comorbid OCD and TS patients (n=2) withdrew after 5 treatments due to lack of efficacy.	✓	Intention to treat analysis.	!	3 month FU conducted, outcomes not reported.	High
Prasko et al., 2006 (Czech Republic)	!	Sham- 90 degree tilt method, possible neural effects. Blinding not assessed. 3 drop outs prior to treatment. Baseline YBOCS was significantly higher in active group.	✓		✓		Medium
Sachdev et al., 2007 (Australia)	✓	Sham coil, and active coil used. Blinding effective.	✓		!	Only graphical reporting for primary and secondary outcomes.	Medium
Kang et al., 2009 (Korea)	!	Sham- 45 degree tilt method, likely neural effects. Blinding was effective. 1 withdrew from active after 5 treatments.	✓		✓		Medium
Ruffini et al., 2009 (Italy)	?	Sham- 90 degree tilt method, possible neural effects. Blinding not assessed.	✓		?	Change in secondary outcomes not reported.	Medium
Badawy et al., 2010 (Egypt)	?	Sham- tilt method, angle not specified, likely neural effects.	✓		✓		Low

		Blinding not assessed.				
Mantovani et al., 2010 (USA)	!	Sham coil, no sensation effects. 3 withdrew before treatment. Blinding not assessed.	✓	✓		Medium
Sarkhel et al., 2010 (India)	?	Sham- 45 degree tilt method, likely neural effects. Blinding not assessed. Baseline anxiety scores were significantly different between groups.	✓	✓		Low
Kumar & Chadda 2011 (India)	!	1 patient excluded due to manic symptoms after the 3 <sup>rd</sup> session.	✓	?	Standard deviations not reported.	Medium
Mansur et al., 2011 (Brazil)	!	Sham- deactivated coil, no sensation effects. Blinding was effective. 1 withdrew from each group, 1 in the active group was lost to FU.	✓	✓		Medium
Gomes et al., 2012 (Brazil)	✓	Sham coil, no sensation effects.	✓	✓		Low
Nauczyciel et al., 2014 (France)	✓	Sham coil, no sensation effects. Blinding not assessed.	✓	?	Standard deviations not reported.	Low
Xiaoyan et al., 2014 (China)	!	Sham method not reported. Blinding not assessed. 2 patients in each group withdrew after 2 and 3 sessions.	✓	✓		Medium
Elbeh et al., 2015 (Egypt)	?	Sham- 90 degree tilt method, possible	✓	✓		Low

		neural effects. Blinding not assessed				
Haghighi et al., 2015 (Iran)	?	Sham- 45-90 degree tilt method, possible neural effects.	✓		✓	Low
Modirrousta et al., 2014 (Canada)	✓		✓		!	Change in secondary outcomes not reported. Follow up YBOCS reported in graphical form only. Claim 100% response rate, but criteria not defined. Medium
Dunlop et al., 2016 (Canada)	!	1 withdrew after 14 sessions due to non- response.	✓		✓	Medium
Hawken et al., 2016 (Turkey, Bulgaria)	!	Sham- 90 degree tilt method, possible neural effects. Blinding not assessed. 1 withdrew after first visit, 1 lost to FU. Reporting of dropouts is inconsistent.	✓		!	YBOCS statistics do not provide meaningful results. The conditions with dropouts was not reported. High
Pallanti et al., 2016 (Italy)	✓		✓		!	Mistakes in reporting, the number of responders reported is inconsistent with values reported. Medium
Pelissolo et al., 2016 (France)	!	Sham coil, no sensation effects. Blinding not assessed. 8 drop outs, 3 before treatment (sham), 1 during treatment in	✓		✓	Medium

each group, 3 lost to FU in active.

Seo et al., 2016 (Korea)	!	Sham coil, no sensation effects. 1 drop out before treatment. Stated that patients completed $\geq 70\%$ of sessions, no further details provided.	✓	!	Baseline YBOCS scores not reported, % change not obtainable.	High
Donse et al., 2017 (Netherlands)	!	3 did not complete treatment, 2 due to lack of efficacy, 1 unknown.	✓	!	The number of participants in each stimulation protocol was not specified.	High
Lee et al., 2017 (Korea)	✓		✓	!	State significant change in YBOCS, yet inconsistent with statistics reported.	Medium
Arumugham et al., 2018 (India)	!	Sham coil, no sensation effects. Blinding not assessed. 2 withdrew before treatment, 1 excluded from analysis due to comorbid bipolar and 1 did not follow protocol.	✓	!	Follow up conducted, outcomes not reported.	High
Carmi et al., 2018 (Israel)	!	Sham coil, no sensation effects. Blinding was effective. Deterioration in LF group, thus recruitment stopped and omitted from analysis. 1 withdrew in sham due to conflicting schedule, 2 in active due to	✓	!	YBOCS outcomes presented in graphical form only.	High

		'inconvenience with treatment'.				
Kumar et al., 2018 (India)	✓		✓	✓		Low
Carmi et al., 2019 (US, Israel, Canada)	!	Sham coil, no sensation effects. Blinding was effective. 2 withdrew from sham during treatment and 5 from active, 3 lost to FU.	✓	✓		Medium
Harika-Germaineau et al., 2019 (France)	!	Sham coil, no sensation effects. Blinding not assessed. 2 withdrew before treatment.	✓	✓		Medium
Singh et al., 2019 (India)	✓		✓	✓		Low
Chae et al., 2004 (US)	?	Sham- 45 degree tilt method, possible neural effects.	✓	✓		Low
Orth et al., 2005 (UK)	✓		✓	✓		Low
Kwon et al., 2011 (South Korea)	✓		✓	✓		Low
Le et al., 2013 (China)	✓		✓	✓		Low
Wu et al., 2014 (USA)	!	Sham method not reported. Blinding not assessed.	✓	✓		Medium
Landeros-Weisenberger et al., 2015 (USA)	?	Sham coil, no sensation effects. 1 withdrew from each group due to time commitment.	✓	Intention to treat analysis (last outcome carried forward).	✓	Low



		Blinding was effective.					
Bloch et al., 2016 (Israel)	!	2 withdrew after 7 and 13 sessions.	✓	Intention to treat analysis.	?	Some secondary outcomes not reported.	Medium
Aydin et al., 2019 (Turkey)	!	Sham- 45 degree tilt method, likely neural effects. Blinding not assessed. 1 drop out in sham, 2 lost to FU in active (responders).	✓		!	Incomplete reporting of outcomes, including 1 in sham that deteriorated.	High
Mantovani et al., 2007 (USA)	✓		✓		✓		Low
Talaei et al., 2009 (Iran)	✓		✓		!	Outcomes not reported following a specific stimulation protocol that led to deterioration.	Medium
Mantovani et al., 2010 (USA)	✓		✓		✓		Low
Wu et al., 2010 (UK)	✓		✓		✓		Low
Volpato et al., 2013 (Italy)	?	Sham coil, no sensation effects. Blinding not assessed.	✓		✓		Low
Salatino et al., 2014 (Italy)	!	The patient dropped out after 2 sessions.	✓		✓		Medium
Diefenbach et al. 2015 (USA)	✓		✓		✓		Low
Winkelbeiner et al., 2018 (Switzerland)	✓		✓		?	Raw scores of outcomes not reported, only	Low

						stated as >25% change.	
Kar et al., 2019 (India)	✓		✓		!	Outcomes not reported at follow up.	Medium
DBS risk of bias assessment							
Nuttin et al., 2003 (Belgium)	!	Blinding effective. 2/6 not included in RCT phase. 1 explanted in OL phase.	?	Incomplete data for 1 in OL phase.	✓		Medium
Abelson et al., 2005 (USA)	!	1 explant, 1 suicide.	✓		✓		Medium
Greenberg et al., 2006 (USA)	✓		✓		✓		Low
Mallet et al., 2008 (France)	?	24/33 active contacts were within the target, 4 electrodes not placed within the target.	✓		✓		Low
Goodman et al., 2010 (USA)	✓		✓		!	Primary outcome during the closed label phase not reported or analysed, graphically reported only.	Medium
Greenberg et al., 2010 (USA, Belgium)	✓	Target shifted across implants	✓		✓		Low
Huff et al, 2010 (Germany)	✓		✓		✓		Low
Mantione et al., 2014 (Netherlands)	✓		✓		✓		Low
Suetens et al., 2014 (Belgium)	?	Sham condition ended early for some, reasons not specified.	✓		!	Duration of intervention, and primary outcomes for sham condition not reported.	Medium

Islam et al., 2015 (Italy)	✓		!	Errors and inconsistencies in reporting.	!	Primary outcome not reported, graphical form only. Significant change reported, yet statistics not.	High
Fayad et al., 2016 (USA)	!	1 patient had DBS switched off, reasoning not reported.	!	1 lost to FU	!	Primary outcome not reported, graphical form only.	High
Luyten et al., 2016 (Belgium)	!	14 ended the sham phase early, 3 ended the active phase early. 6 had DBS switched off or explanted at long term FU.	!	17/24 completed closed label phase, reasons not reported. 6 were not receiving DBS at long term FU.	✓		High
Farrand et al., 2018 (Australia)	✓		✓		✓		Low
Barcia et al., 2019 (Spain)	?	Wash-out implemented during closed label phase.	✓		✓		Low
Lee et al., 2019 (USA)	!	1 patient had DBS explanted at 21 months.	✓		!	Short-term follow up scores not reported.	High
Huys et al., 2019 (Germany)	✓		✓		✓		Low
Mallet et al., 2019 (France)	!	2 had infection and explant (1 before blinding), 2 switched off (10, 22 months), 1 explanted (20 months).	✓		✓		Medium
Tyagi et al., 2019 (UK)	?	1 patient ended a condition early due to worsening and switched targets.	✓		✓		Low

Liebrand et al., 2019 (Netherlands)	✓		✓	✓		Low
Gabriels et al., 2003 (Belgium)	!	1 patient explanted at 15 months.	✓	!	Primary outcome scores not reported, graphical form only.	High
Franzini et al., 2010 (Italy)	✓		✓	✓		Low
Grant et al., 2011 (USA)	✓		✓	✓		Low
Roh et al., 2012 (South Korea)	✓		✓	✓		Low
Coenen et al., 2014 (Germany)	✓		✓	?	Some secondary outcomes not reported	Low
2Tsai et al., 2014 (China)	?	1 had allergy to battery at 16 months	✓	✓		Low
Maarouf et al., 2016 (Germany)	!	2 had DBS explanted, 1 had DBS switched off.	✓	!	Primary outcome not reported for 1 patient.	High
Chang et al., 2017 (China)	?	Device explanted (and re-implanted) at 12 months due to skin picking and anxiety.	✓	✓		Low
Choudhury et al., 2017 (USA)	✓		✓	✓		Low
Gupta et al., 2019 (India)	✓		✓	✓		Low
Maciunas et al., 2007 (USA)	✓		✓	✓		Low
Servello et al., 2008 (UK)	✓		✓	✓		Low
Porta et al., 2009 (UK)	!	3 had DBS switched off, 1 required additional leads within the GPI.	✓	✓		Medium

Ackermans et al., 2011 (Netherlands)	!	Dropouts prior to randomization, specifics not reported. Conditions ended early for 6, reasons not reported.	✓		!	Inconsistent reporting in primary outcome.	High
Martinez-Fernandez et al., 2011 (USA)	?	1 had lead re-positioned due to limited efficacy. 1 had re-implant due to infection.	✓		✓		Low
Cannon et al., 2012 (Australia)	!	3 had hardware malfunction, 1 discontinued DBS at 3 months due to worsening.	✓		!	Outcomes not reported at final FU.	High
Porta et al., 2012 (Italy)	!	2 had DBS switched off and remained in FU, 1 deceased from unrelated cause.	✓		✓		Medium
Motlagh et al., 2013 (USA)	!	2 had DBS explanted at 3 years, due to infection and lack of efficacy. 1 had additional leads placed in the GPi.	✓		✓		Medium
Okun et al., 2013 (US)	✓		✓		✓		Low
Sachdev et al., 2014 (Australia)	!	1 had device malfunction and relapse of substance abuse. 1 had DBS switched off at 3 months due to worsening.	?	Missing data for 1 participant.	✓		Medium
Zhang et al., 2014 (China)	!	1 had explant at 1 week. 3 had device explanted, 2 due to resumed normality, 1 due to side effects.	!	2 lost to FU at 18 months.	✓		High

Kefalopoulou et al., 2015 (UK)	!	2 withdrew before randomisation/ switch on. 1 withdrew from closed label phase from increased anxiety. 2 had programming and medication adjustments during closed label phase.	?	2 incomplete assessments due to fatigue.	✓	Medium
Huys et al., 2016 (Germany)	✓		✓		✓	Low
Rossi et al., 2016 (USA)	!	1 lost to FU at 18 months.	✓		✓	Medium
Testini et al., 2016 (USA)	?	1 trialled DBS switched off due to lack of efficacy.	!	1 lost to FU. YGTSS was not administered for every patient at every follow up.	✓	Medium
Welter et al., 2017 (France)	!	3 withdrew before randomisation; 2 due to infection and device removal, 1 due to alcoholism. 1 had misplaced leads and underwent re-implant.  Post-op/ switch on outcomes used as baseline as opposed to pre-op outcomes.	✓		✓	Medium
Azimi et al., 2018 (Iran)	✓		✓		✓	Low
Brito et al., 2019 (Brazil)	✓		✓		✓	Low
Welter et al., 2019 (France)	!	5 lost to FU, 4 at 30 months, 1 at 48 months.	✓		✓	Medium
Diederich et al., 2005 (Australia)	✓		✓		✓	Low

Flaherty et al., 2005 (USA)	✓		✓	✓	Low
Houeto et al., 2005 (France)	✓		✓	✓	Low
Kuhn et al., 2007 (Germany)	✓		✓	✓	Low
Shahed et al., 2007 (USA)	✓		✓	✓	Low
Shields et al., 2008 (USA)	?	Leads replaced due to head jerks and malfunction, target changed due to side effects.	✓	✓	Low
Dehning et al., 2008 (Germany)	✓		✓	✓	Low
Welter et al., 2008 (France)	✓		✓	! Sham outcomes not reported, graphical form only.	Medium
Dehning et al., 2011 (Germany)	!	1 had repositioning at 8 months, and then switch off 5 months later.	✓	✓	Medium
Pullen et al., 2011 (USA)	✓		✓	✓	Low
Rzesnitzek et al., 2011 (USA)	✓		✓	✓	Low
Piedimonte et al., 2013 (Argentina)	✓		✓	✓	Low
Savica et al, 2012 (USA)	✓		✓	✓	Low
Massano et al., 2013 (Portugal)	✓		✓	✓	Low
Dong et al., 2014 (China)	✓		✓	✓	Low
Huasen et al., 2014 (UK)	✓		✓	✓	Low
Nair et al., 2014 (Australia)	✓		✓	✓	Low
Patel et al., 2014 (USA)	?	Hardware failure at 14 months.	✓	✓	Low

Wojtecki et al., 2016 (Germany)	✓		✓	✓	Low
Kano et al., 2018 (Japan)	✓		✓	✓	Low
Kakusa et al., 2019 (USA)	✓		✓	✓	Low
Rossi et al., 2019 (Argentina)	?	Unilateral lead failure at 14 months, no worsening of symptoms	✓	✓	Low
Zhu et al., 2019 (China)	!	1 withdrew due to lack of clinical efficacy	✓	✓	Medium
Burdick et al., 2010 (USA)	✓		✓	✓	Low
Baldermann et al., 2016 (Germany)	✓		✓	✓	Low