http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Box S1 Database search strategy

Database	**Keywords and descriptors**
Cochrane Library (CENTRAL)	**Search #1:** (“OCD” OR “Obsessive-Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive-Compulsive Neurosis” OR “Obsessive-Compulsive Neuroses” OR “Obsessive Compulsive Neurosis” OR “Obsessive Compulsive Neuroses” OR “Anankastic Personality” OR “Anankastic Personalities”) **Search #2:** (“TMS” OR “rTMS” OR “Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulations” OR “Repetitive Transcranial Magnetic Stimulation" OR “Transcranial Magnetic Stimulation Single Pulse” OR “Transcranial Magnetic Stimulation Paired Pulse”) **Search #3:** #1 AND #2
MEDLINE	**Search #1:** (“OCD” OR “Obsessive-Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive-Compulsive Neurosis” OR “Obsessive-Compulsive Neuroses” OR “Obsessive Compulsive Neurosis” OR “Obsessive Compulsive Neuroses” OR “Anankastic Personality” OR “Anankastic Personalities”). **Search #2:** (“TMS” OR “rTMS” OR Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulations” OR “Repetitive Transcranial Magnetic Stimulation" OR “Transcranial Magnetic Stimulation Single Pulse” OR “Transcranial Magnetic Stimulation Paired Pulse”) **Search #3:** (“random*[tiab] OR “clinical trial [tiab]”) **Search #4:** #1 AND #2 AND #3
Web of Science	**Search #1: TS=**(“OCD” OR “Obsessive-Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive-Compulsive Neurosis” OR “Obsessive-Compulsive Neuroses” OR “Obsessive Compulsive Neurosis” OR “Obsessive Compulsive Neuroses” OR “Anankastic Personality” OR “Anankastic Personalities”) **Search #2: TS=**(“TMS” OR “rTMS” OR “Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulations” OR “Repetitive Transcranial Magnetic Stimulation" OR “Transcranial Magnetic Stimulation Single Pulse” OR “Transcranial Magnetic Stimulation Paired Pulse”) **Search #3: TS**=(“random” OR “clinical trial”) **Search #4:** #1 AND #2 AND #3

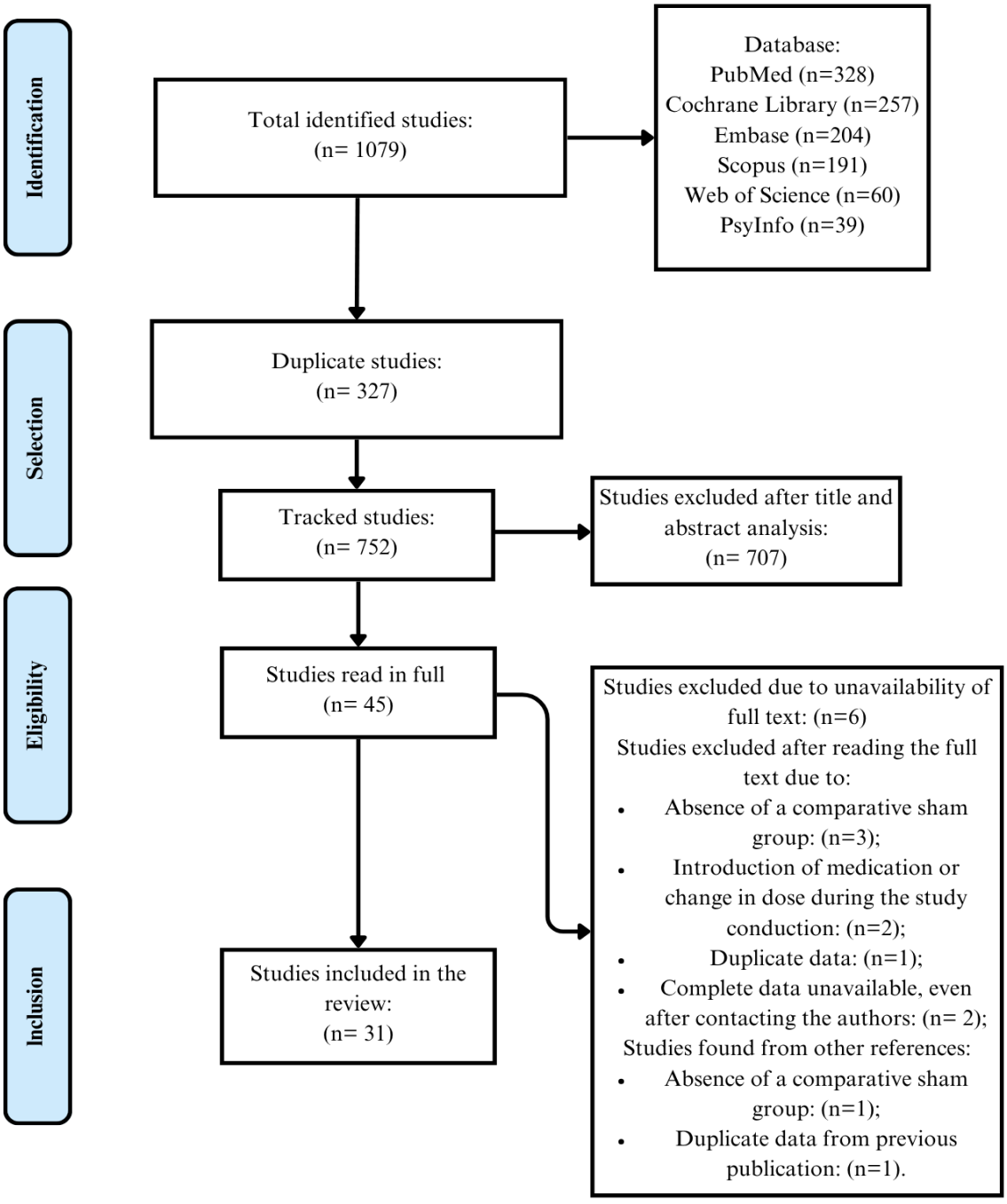
http://doi.org/10.47626/1516-4446-2025-4515

Database	Keywords and descriptors
SCOPUS	(**Title-Abs-Key** (“OCD” OR “Obsessive-Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive-Compulsive Neurosis” OR “Obsessive-Compulsive Neuroses” OR “Obsessive Compulsive Neurosis” OR “Obsessive Compulsive Neuroses” OR “Anankastic Personality” OR “Anankastic Personalities”) AND (**Title-Abs- Key** (“TMS” OR “rTMS” OR “Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulations” OR “Repetitive Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulation Single Pulse” OR “Transcranial Magnetic Stimulation Paired Pulse”) (**Title-Abs- Key** (“random” OR “clinical trial”)
PsycInfo	**Any Field:** (“Obsessive Compulsive Disorder”) AND **Any Field:** (“Transcranial Magnetic Stimulation”) AND **Any Field:** (“clinical trial”)
EMBASE	**All fields** (“OCD” OR “Obsessive-Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive Compulsive Disorder” OR “Obsessive-Compulsive Disorders” OR “Obsessive-Compulsive Neurosis” OR “Obsessive-Compulsive Neuroses” OR “Obsessive Compulsive Neurosis” OR “Obsessive Compulsive Neuroses” OR “Anankastic Personality” OR “Anankastic Personalities”) AND **All fields (**“TMS” OR “rTMS” OR “Transcranial Magnetic Stimulation” OR “Transcranial Magnetic Stimulations” OR “Repetitive Transcranial Magnetic Stimulation" OR “Transcranial Magnetic Stimulation Single Pulse” OR “Transcranial Magnetic Stimulation Paired Pulse”) AND **All fields** (“random” OR “clinical trial”)

OCD = obsessive-compulsive disorder; TMS = transcranial magnetic stimulation; rTMS = repetitive TMS.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Figure S1 PRISMA flowchart



http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Figure S2 Risk of bias assessment for the included studies

	Bias arising from the randomization process	Bias due to deviations from intended interventions	Bias due to missing outcome data	Bias in measurement of the outcome	Bias in selection of the reported result	Overall risk of bias
Alonso et al., 2001	Unclear	Low	Low	Low	Unclear	Unclear
Arumugham et al., 2018	Low	Low	Low	Low	Low	Low
Badawy et al., 2010	High	Unclear	Low	Low	Unclear	High
Carmi et al., 2019	Low	Low	Low	Low	Low	Low
Dutta et al., 2021	Unclear	Low	Low	Low	Low	Unclear
Elbeh et al., 2016	Low	Unclear	Low	Low	Low	Low
Gomes et al., 2012	Low	Unclear	Low	Low	Unclear	Unclear
Guo et al., 2022	Low	Unclear	Low	Low	Low	Unclear
Haghighi et al., 2015	Unclear	Unclear	Low	Low	Low	Unclear
Harika-Germaneau et al., 2019	Low	Low	Low	Low	Low	Low
Hawken et al., 2016	Unclear	High	Low	Low	Unclear	High
Jahanbakhsh et al., 2023	Low	Unclear	Low	Low	Low	Low
Jahangard et al., 2016	Unclear	High	Low	Low	Low	High
Ji et al., 2021	Low	Low	Unclear	Low	Low	Low
Kang et al., 2009	Low	Unclear	Low	Low	Low	Low
Khedr et al., 2022	Low	Low	Low	Low	Low	Low
Liu et al., 2021	Low	Unclear	Low	Low	Unclear	Unclear
Ma et al., 2014	Low	Low	Low	Low	Unclear	Low
Mantovani et al., 2010	Low	Low	Low	Low	Unclear	Low
Mansur et al., 2011	Unclear	High	Low	Low	Unclear	High
Mukherjee et al., 2022	Low	Unclear	Low	Low	Unclear	Unclear
Nauczyciel et al., 2014	Low	Unclear	Low	Low	Unclear	Unclear
Ozer et al., 2024	Low	Low	Low	Low	Low	Low
Pelissolo et al., 2016	Low	Low	Unclear	Low	Unclear	Unclear
Prasko et al., 2006	Low	Low	Low	Low	Unclear	Unclear
Ruffini et al., 2008	Unclear	Unclear	Low	Low	Unclear	Unclear
Sachev et al., 2007	Low	Low	Low	Low	Unclear	Unclear
Sarkhel et al., 2010	Unclear	Unclear	Low	Unclear	Unclear	Unclear
Seo et al., 2016	Unclear	High	Low	Unclear	Low	High
Shayganfard et al., 2016	Unclear	High	Low	Low	Low	High
Ziblak et al., 2021	Low	Low	Low	Low	Low	Low

The risk of bias was assessed using the Cochrane Risk of Bias tool. Low risk: low risk in all domains or low risk in all domains except for unclear risk in allocation concealment due to selection bias. Unclear risk: at least one domain with unclear risk of bias, excluding allocation concealment due to selection bias. High risk: at least one domain with high risk of bias in any area.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Table S1 Characteristics of the included studies

	ACTIVE rTMS				SHAM rTMS					
Study	**N**	**Age**	**M/F**	**Illness duration (months)**	**N**	**Age**	**M/F**	**Illness duration (months)**	**Coil type**	**Targeting**
Alonso et al.[1]	10	39.2±13.05	2/8	-	8	30.38±9.59	4/4	-	Circular	MRI neuronavigation
Arumugham et al.[2]	19	27.74±7.88	16/3	10.47±7.21	17	30.71±10.43	12/5	8.47±6.43	Figure-8 coil	10-20 EEG system
Badawy et al.[3]	20	26±5.582	10/10	5.8±4.948	17	28.9±5.7	7/10	6.3±3.063	-	-
Carmi et al.[4]	46	41.1±11.97	20/27	-	47	36.5±11.38	19/28	-	H7 coil	5 cm rule
Dutta et al.[5]	16	23.05±12.37	5/13	8.89±7.04	15	28.33±7.4	11/4	-	Figure-8 coil	10-20 EEG system
Elbeh et al.[6]	15	26.87±5.2	11/4	1.86±11.2	15	25.57±4.0	10/5	16.77±9.2	Figure-8 coil	5 cm rule
	15	28.97±3.9	9/6	1.69±4.2	15	25.57±4.0	10/5	16.77±9.2	Figure-8 coil	5 cm rule
Gomes et al.[7]	12	35.5±7.5	4/8	17.0±8.0	10	37.5±16	5/5	19.5±12	Figure-8 coil	10-20 EEG system
Guo et al.[8]	26	35±9.52	18/8	114.81±92.6	24	30.29±7.80	15/9	82.61±75.314	Figure-8 coil	10-20 EEG system
Haghighi et al.[9]	10	34.90±5.91	7/3	-	11	36.55±3.95	5/6	-	Circular coil	5 cm rule
Harika-Germaneau et al.[10]	14	46.3±10.1	5/9	29.5±9.4	14	48.2±12.9	8/6	23.9±16.3	Figure-8 coil	MRI neuronavigation
Hawken et al.[11]	10	33±10	-	-	12	34±14	-	-	Figure 8-coil	10-20 EEG system
Jahanbakhsh et al.[12]	15	34.07±8.34	6/9	13.53±8.44	15	34.53±9.75	4/11	13.87±6.99	Figure-8 coil	5 cm rule
Jahangard et al.[13]	5	32.40±8.97	1/4	-	5	33.80±5.81	2/3	-	Circular coil	5 cm rule
Ji et al.[14]	20	27.75±1.58	15/5	5.81±0.90	17	27.65±1.73	12/5	4.24±0.88		
Kang et al.[15]	10	28.60±12.66	8/2	8.17±3.81	10	26.20±10.52	9/1	9.46±9.41	Circular coil	10-20 EEG system
Khedr et al.[16]	20	36.9±11.5	9/11	65.85±76.7	20	35.35±9.38	10/10	60.7±61.22	Figure-8 coil	MRI neuronavigation
	20	34.05±10.23	9/11	57.75±54.1	20	35.35±9.38	10/10	60.7±61.22	Circular coil	-
Liu et al.[17]	12	28.17±9.81	5/7	8.25±7.66	11	31±7.50	5/6	10.27±5.10	Figure-8 coil	10-20 EEG system
Ma et al.[18]	25	27.12±8.97	17/8	11.40±5.65	21	29.86±9.42	13/8	13.48±5.34	Circular coil	10-20 EEG system
Mantovani et al.[19]	9	39.7±8.6	5/4	22.4±13.8	9	39.4±10.2	6/3	22.1±7.3	Circular coil	10-20 EEG system
Mansur et al.[20]	13	42.1±11.9	7/6	26.2±14.0	14	39.3±13.9	6/8	15.6±11.5	Figure-8 coil	-

Mukherjee et al.[21]	13	32.84±9.55	7/6	9.46±8.30	13	30.69±9.94	7/6	7.69±8.54	Figure-8 coil	5cm rule
Nauczyciel et al.[22]	10	40±24.56	2/8	-	9	39±26.56	2/7	-	Figure-8 coil	10-20 EEG system
Ozer et al.[23]	14	34.5±13.3	5/9	13.1±3.6	15	37.9±13.9	6/9	11.1±4.7	Figure-8 coil	5cm rule
Pelissolo et al.[24]	20	39.1±10.4	13/7	19.8±12.8	16	42.3±10.6	9/7	24±10.9	Figure-8 coil	-
Prasko et al.[25]	18	28.9±7.7	13/5	14.6±7.3	12	33.4±8.7	5/7	16.3±7.9	Circular coil	5cm rule
Ruffini et al.[26]	16	-	-	-	7	-	-	-	Circular coil	10-20 EEG system
Sachdev et al.[27]	10	29.5±9.9	3/7	12.6±7.5	8	35.7±8.2	5/3	12.3±5.4	Figure-8 coil	5cm rule
Sarkhel et al.[28]	21	29.38±6.55	10/11	7.91±6.78	21	25.76±8.19	13/8	6.19±5.52	Figure-8 coil	5cm rule
Seo et al.[29]	14	34.6±9.8	8/6	9.8±8.0	13	36.3±12.5	6/7	11.7±9.5	Figure-8 coil	5cm rule
Shayganfard et al.[30]	5	33.80±9.55	1/4	-	5	33.20±7.86	3/2	-	Circular coil	5cm rule
Ziblak et al.[31]	19	41.47±10.23	5/14	17.32±9.21	15	36.53±13.69	6/9	11.93±3.61	Figure-8 coil	10-20 EEG system

rTMS PARAMETERS

Study	Protocol type	Hz	%rMT	Cortical target	No. sessions	Stimulation time (min)	Duration (weeks)	Total of pulses	Pulses per session	Follow-up (weeks)	Treatment resistant
Alonso et al.[1]	rTMS	1	110	R-DLPFC	18	20	6	-	-	4	No
Arumugham et al.[2]	rTMS	1	100	BL-Pre-SMA	18	-	3	21.600	1.200	9	-
Badawy et al.[3]	rTMS	20	-	L-DLPFC	15	-	3	-	-	-	Yes
Carmi et al.[4]	dTMS	20	100	mPFC/ACC	30	-	6	60.000	2.000	4	Yes
Dutta et al.[5]	cTBS	5	80	OFC	10	30	1	12.00	1.200	2	-
Elbeh et al.[6]	rTMS	1	100	DLPFC	10	-	2	20.000	2.000	12	-
	rTMS	10	100	DLPFC	10	-	2	20.000	2.000	12	-
Gomes et al.[7]	rTMS	1	110	BL-Pre-SMA	10	20	2	12.000	1.200	12	Yes
Guo et al.[8]	cTBS	5	40	BL-SMA	20	-	4	24.000	1.200	4	-
Haghighi et al.[9]	rTMS	20	100	L-DLPFC	10	50	2	7.500	750	-	Yes
Harika-Germaneau et al.[10]	cTBS	5	80	Pre-SMA	30	-	6	18.000	600	6	Yes

Hawken et al.[11]	rTMS	1	110	BL-SMA	25	20	6	-	-	2	Yes
Jahanbakhsh et al.[12]	rTMS	1	-	L-DLPFC	15	20	5	18.000	1.200	12	Yes
Jahangard et al.[13]	rTMS	20	100	L-DLPFC	20	25	4	15.000	750	-	Yes
Ji et al.[14]	rTMS	1	110	R-Pre-SMA	14	30	2	-	-	-	-
Kang et al.[15]	rTMS	1	110	R-DLPFC	10	10	2	12.000	1.200	2	Yes
	rTMS	1	110	SMA	10	10	2	12.000	1.200	2	Yes
Khedr et al.[16]	rTMS	1	120	DLPFC	10	-	2	15.000	1.500	12	-
	rTMS	1	120	OFC	10	-	2	15.000	1.500	12	-
Liu et al.[17]	cTBS	5	80	OFC	20	15	2	12.000	600	4	Yes
Ma et al.[18]	rTMS	5	80	BL-DLPFC	10	20	2	8.720	872	1	No
Mantovani et al.[19]	rTMS	1	100	BL-Pre-SMA	20	20	4	24.000	1.200	-	No
Mansur et al.[20]	rTMS	10	110	R-DLPFC	30	-	6	60.000	2.000	6	Yes
Mukherjee et al.[21]	cTBS	5	80	SMA	30	-	3	54.000	1.800	5	-
Nauczyciel et al.[22]	rTMS	1	120	OFC	10	-	1	12.000	1.200	4	Yes
Ozer et al.[23]	dTMS	20	110	mPFC/ACC	30	17	3	60.000	2.000	-	Yes
Pelissolo et al.[24]	rTMS	1	100	BL-Pre-SMA	20	26	4	30.000	1.500	8	Yes
Prasko et al.[25]	rTMS	1	110	L-DLPFC	10	30	2	18.000	1.800	2	Yes
Ruffini et al. [26]	rTMS	1	80	L-OFC	15	10	3	-	-	2	-
Sachdev et al.[27]	rTMS	10	110	L-DLPFC	10	-	2	15.000	1.500	-	Yes
Sarkhel et al.[28]	rTMS	10	110	R-DLPFC	10	-	2	-	-	2	-
Seo et al.[29]	rTMS	1	100	R-DLPFC	15	20	3	18.000	1.200	-	Yes
Shayganfard et al.[30]	rTMS	20	100	L-DLPFC	10	50	2	7.500	750	-	Yes
Ziblak et al.[31]	rTMS	1	110	OFC	20	17	2	20.000	1.000	-	Yes

cTBS = continuous theta burst stimulation; EEG = electroencephalogram; MRI = magnetic resonance imaging; rTMS = repetitive transcranial magnetic stimulation.

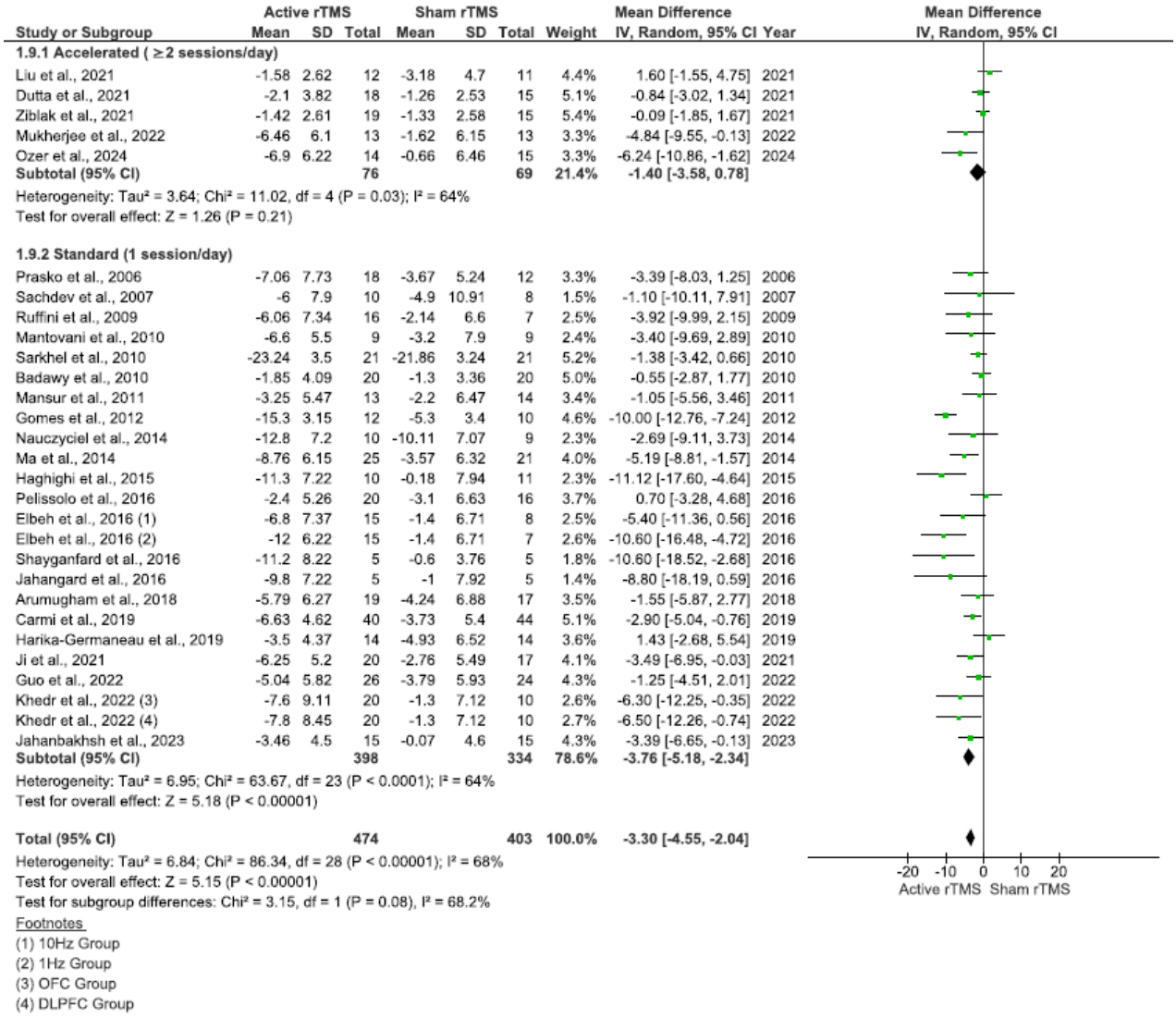
Supplementary Table S2 Overview of methodological characteristics

Study	Analysis type (ITT vs PP)	Sham integrity assessed? (Yes/No)	Antidepressant use	Medication stable dose ≥ 2 months	Benzodiazepine use
Alonso et al.[1]	NR	Yes	Yes	Yes	No
Arumugham et al.[2]	ITT	Yes	Yes	Yes	No
Badawy et al.[3]	NR	Yes	No	No	No
Carmi et al.[4]	ITT	Yes	Yes	Yes	No
Dutta et al.[5]	NR	NR	Yes	Yes	Yes
Elbeh et al.[6]	NR	Yes	Yes	NR	No
Gomes et al.[7]	NR	Yes	Yes	NR	Yes
Ji et al.[8]	NR	Yes	NR	Yes	NR
Guo et al.[9]	ITT	Yes	NR	NR	NR
Haghighi et al.[10]	NR	Yes	Yes	NR	No
Harika-Germaneau et al.[11]	NR	Yes	Yes	Yes	Yes
Hawken et al.[12]	ITT	Yes	Yes	Yes	Yes
Jahanbakhsh et al.[13]	NR	Yes	Yes	NR	No
Jahangard et al.[14]	NR	Yes	Yes	Yes	No
Kang et al.[15]	NR	Yes	Yes	Yes	Yes
Khedr et al.[16]	NR	Yes	NR	NR	NR
Liu et al.[17]	NR	Yes	Yes	Yes	Yes
Ma et al.[18]	NR	Yes	Yes	No	No
Mansur et al.[19]	NR	Yes	Yes	Yes	Yes
Mantovani et al.[20]	NR	Yes	Yes	Yes	No
Mukherjee et al.[21]	NR	Yes	NR	NR	NR
Nauczyciel et al.[22]	PP	Yes	Yes	No	Yes
Ozer et al.[23]	ITT	Yes	Yes	Yes	Yes
Pelissolo et al.[24]	ITT	Yes	Yes	Yes	Yes
Prasko et al.[25]	NR	Yes	Yes	Yes	No
Ruffini et al.[26]	NR	Yes	Yes	Yes	Yes
Sachdev et al.[27]	NR	Yes	NR	NR	NR
Sarkhel et al.[28]	NR	Yes	NR	NR	NR
Seo et al.[29]	NR	Yes	Yes	NR	Yes
Shayganfard et al.[30]	NR	Yes	Yes	NR	No
Ziblak et al.[31]	NR	Yes	Yes	NR	No

ITT = intention to treat analysis; PP = per protocol analysis; NR = not reported.

http://doi.org/10.47626/1516-4446-2025-4515
Effects of repetitive transcranial magnetic stimulation on obsessive-compulsive disorder: a systematic review, meta-analysis, and meta-regression – Figueiredo MMC et al.

Supplementary Figure S3 Treatment effects in accelerated and standard protocols



Footnotes
(1) 10Hz Group
(2) 1Hz Group
(3) OFC Group
(4) DLPFC Group

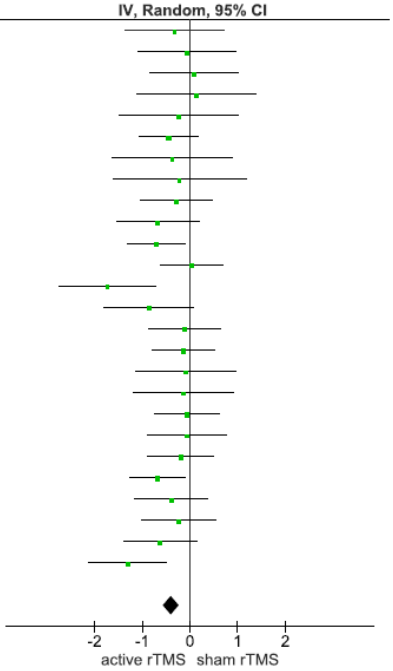
rTMS = repetitive transcranial magnetic stimulation; SMD = standard mean deviation; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

http://doi.org/10.47626/1516-4446-2025-4515
Effects of repetitive transcranial magnetic stimulation on obsessive-compulsive disorder: a systematic review, meta-analysis, and meta-regression – Figueiredo MMC et al.

Supplementary Figure S4 Treatment effects on anxiety

Study or Subgroup	Active rTMS Mean	SD	Total	Sham rTMS Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Year
Prasko et al., 2006	-5.65	10.02	9	-2.08	10.87	6	2.3%	-0.32 [-1.37, 0.72]	2006
Prasko et al., 2006	-5.82	7.79	9	-5.33	6.08	6	2.4%	-0.06 [-1.10, 0.97]	2006
Sachdev et al., 2007	-2.5	12.93	10	-3.9	17.83	8	2.9%	0.09 [-0.84, 1.02]	2007
Kang et al., 2009	-2.8	7.35	5	-4	8.03	5	1.6%	0.14 [-1.10, 1.38]	2009
Kang et al., 2009	-2.1	5.5	5	-0.9	3.66	5	1.6%	-0.23 [-1.48, 1.01]	2009
Sarkhel et al., 2010	-19.14	3.85	21	-17.47	3.43	21	6.7%	-0.45 [-1.06, 0.16]	2010
Mantovani et al., 2010	-6.9	8.8	5	-3.5	7.53	5	1.6%	-0.37 [-1.63, 0.88]	2010
Mantovani et al., 2010	-5.2	11.01	4	-2.9	6.78	4	1.3%	-0.22 [-1.61, 1.18]	2010
Mansur et al., 2011	-7.42	9.42	13	-4.86	8.4	14	4.4%	-0.28 [-1.04, 0.48]	2011
Gomes et al., 2012	-12	8.35	12	-6.1	8.45	10	3.3%	-0.68 [-1.54, 0.19]	2012
Ma et al., 2014	-5.04	5.3	25	-1.76	3.6	21	7.0%	-0.70 [-1.30, -0.10]	2014
Pelissolo et al., 2016	1	6.85	20	0.8	6.97	16	5.8%	0.03 [-0.63, 0.69]	2016
Elbeh et al., 2016 (1)	-12.3	6.3	15	-1.7	5	8	2.4%	-1.73 [-2.75, -0.71]	2016
Elbeh et al., 2016 (2)	-7.3	6.78	15	-1.7	5	7	2.9%	-0.86 [-1.79, 0.08]	2016
Seo et al., 2016	-5.6	11.86	14	-4.4	6.6	13	4.4%	-0.12 [-0.88, 0.64]	2016
Arumugham et al., 2018	-2	4.53	19	-1.29	5.24	17	5.9%	-0.14 [-0.80, 0.51]	2018
Harika-Germaneau et al., 2019	-4.64	8.53	7	-4	6.52	7	2.3%	-0.08 [-1.13, 0.97]	2019
Harika-Germaneau et al., 2019	-4.42	7.47	7	-3.29	7.63	7	2.3%	-0.14 [-1.19, 0.91]	2019
Ziblak et al., 2021	-0.37	2.46	19	-0.2	2.15	15	5.5%	-0.07 [-0.75, 0.61]	2021
Liu et al., 2021	-2.91	4.74	12	-2.55	6.24	11	3.8%	-0.06 [-0.88, 0.76]	2021
Dutta et al., 2021	-3.39	5.71	18	-2.34	4.86	15	5.3%	-0.19 [-0.88, 0.50]	2021
Guo et al., 2022	-5.81	6.88	26	-0.35	8.82	24	7.7%	-0.68 [-1.25, -0.11]	2022
Khedr et al., 2022 (3)	-5	7.07	20	-2.2	6.6	10	4.3%	-0.39 [-1.16, 0.37]	2022
Mukherjee et al., 2022	-3.31	5.23	13	-2	5.64	13	4.2%	-0.23 [-1.01, 0.54]	2022
Khedr et al., 2022 (4)	-6.2	6.13	20	-2.2	6.6	10	4.2%	-0.62 [-1.40, 0.16]	2022
Ozer et al., 2024	-3.9	3.18	14	1.2	4.3	15	3.8%	-1.30 [-2.12, -0.49]	2024
Total (95% CI)			**357**			**293**	**100.0%**	**-0.39 [-0.54, -0.23]**	

Heterogeneity: Tau² = 0.00; Chi² = 22.68, df = 25 (P = 0.60); I² = 0%
Test for overall effect: Z = 4.76 (P < 0.00001)



Footnotes
(1) 10Hz group
(2) 1Hz group
(3) OFC group
(4) DLPFC group

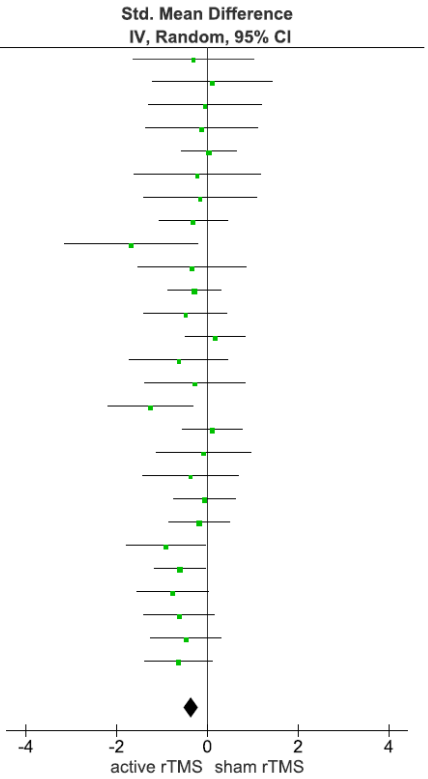
rTMS = repetitive transcranial magnetic stimulation; SMD = standard mean deviation; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

http://doi.org/10.47626/1516-4446-2025-4515
Effects of repetitive transcranial magnetic stimulation on obsessive-compulsive disorder: a systematic review, meta-analysis, and meta-regression – Figueiredo MMC et al.

Supplementary Figure S5 Treatment effects on depression

Study or Subgroup	Active rTMS Mean	SD	Total	Sham rTMS Mean	SD	Total	Weight	Std. Mean Difference IV, Random, 95% CI	Year
Sachdev et al., 2007	-6.9	12.87	5	-2.6	11.45	4	1.5%	-0.31 [-1.64, 1.02]	2007
Sachdev et al., 2007	-2.2	8.7	5	-3.4	10.69	4	1.5%	0.11 [-1.21, 1.43]	2007
Kang et al., 2009	-0.7	8.43	5	-0.1	11.64	5	1.7%	-0.05 [-1.29, 1.19]	2009
Kang et al., 2009	-3.4	9.39	5	-2.3	6.89	5	1.7%	-0.12 [-1.36, 1.12]	2009
Sarkhel et al., 2010	-9.9	19	21	-10.47	2.43	21	7.2%	0.04 [-0.56, 0.65]	2010
Mantovani et al., 2010	-3.2	11.02	4	-0.7	8.3	4	1.4%	-0.22 [-1.62, 1.17]	2010
Mantovani et al., 2010	-6.6	16.03	5	-4.3	10.25	5	1.7%	-0.15 [-1.40, 1.09]	2010
Mansur et al., 2011	-5.83	7.5	13	-3.54	6.76	14	4.5%	-0.31 [-1.07, 0.45]	2011
Gomes et al., 2012	-8.5	3.7	6	-1.4	4.05	5	1.2%	-1.68 [-3.16, -0.21]	2012
Gomes et al., 2012	-8.1	8.64	6	-5.1	7.51	5	1.8%	-0.34 [-1.54, 0.86]	2012
Ma et al., 2014	-5.08	5	25	-3.52	5.81	21	7.7%	-0.28 [-0.87, 0.30]	2014
Nauczyciel et al., 2014	-7.5	9.76	10	-3.77	3.3	9	3.1%	-0.48 [-1.39, 0.44]	2014
Pelissolo et al., 2016	1.1	8.1	20	-0.3	7.45	16	6.1%	0.18 [-0.48, 0.83]	2016
Seo et al., 2016	-5.8	6.8	7	-1.5	5.95	7	2.2%	-0.63 [-1.71, 0.45]	2016
Seo et al., 2016	-7	10	7	-4.5	6.23	6	2.2%	-0.27 [-1.37, 0.82]	2016
Hawken et al., 2016	-6	7	10	2	5.29	12	3.0%	-1.26 [-2.19, -0.32]	2016
Arumugham et al., 2018	-0.58	7.1	19	-1.24	4.63	17	6.1%	0.11 [-0.55, 0.76]	2018
Harika-Germaneau et al., 2019	-4.64	8.53	7	-4	6.52	7	2.4%	-0.08 [-1.13, 0.97]	2019
Harika-Germaneau et al., 2019	-5.58	7.54	7	-2.71	6.94	7	2.3%	-0.37 [-1.43, 0.69]	2019
Dutta et al., 2021	-2.33	5.47	18	-2.06	3.8	15	5.6%	-0.06 [-0.74, 0.63]	2021
Ziblak et al., 2021	-0.21	2.3	19	0.2	2.15	15	5.7%	-0.18 [-0.86, 0.50]	2021
Liu et al., 2021	-7.16	5.69	12	-2.36	4.33	11	3.5%	-0.91 [-1.78, -0.04]	2021
Guo et al., 2022	-6.05	7.42	26	-0.55	10.39	24	8.1%	-0.60 [-1.17, -0.04]	2022
Khedr et al., 2022 (1)	-8	7.14	20	-2.7	5.52	10	4.2%	-0.77 [-1.56, 0.01]	2022
Khedr et al., 2022 (2)	-6.7	6.65	20	-2.7	5.52	10	4.4%	-0.62 [-1.39, 0.16]	2022
Mukherjee et al., 2022	-3.92	4.36	13	-1.46	5.66	13	4.3%	-0.47 [-1.25, 0.31]	2022
Ozer et al., 2024	-1.9	2.98	14	0	2.85	15	4.7%	-0.63 [-1.38, 0.12]	2024
Total (95% CI)			**329**			**287**	**100.0%**	**-0.34 [-0.50, -0.18]**	

Heterogeneity: Tau² = 0.00; Chi² = 19.81, df = 26 (P = 0.80); I² = 0%
Test for overall effect: Z = 4.13 (P < 0.0001)

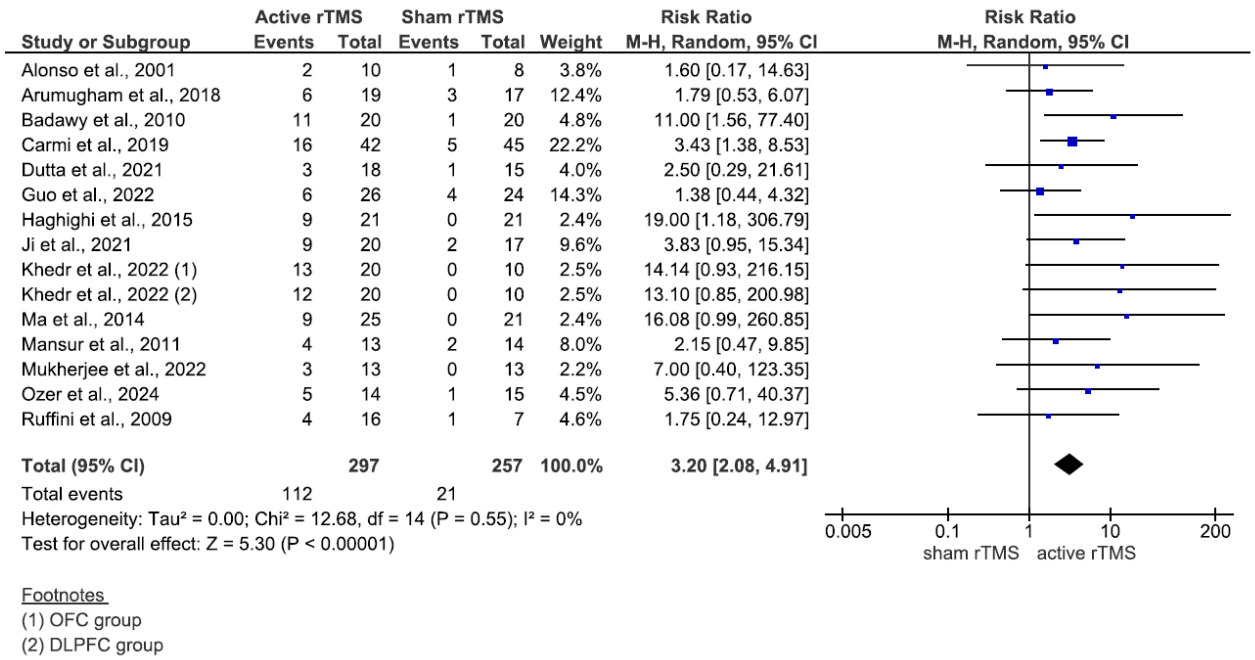


Footnotes
(1) OFC group
(2) DLPFC group

rTMS = repetitive transcranial magnetic stimulation; SMD = standard mean deviation; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

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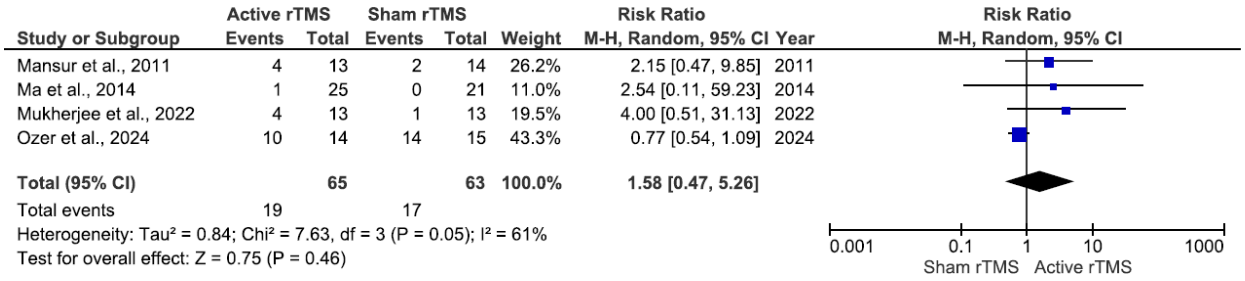
Supplementary Figure S6 Treatment response based on Y-BOCS ≥35%



Footnotes
(1) OFC group
(2) DLPFC group

rTMS = repetitive transcranial magnetic stimulation; RR = risk ratio; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

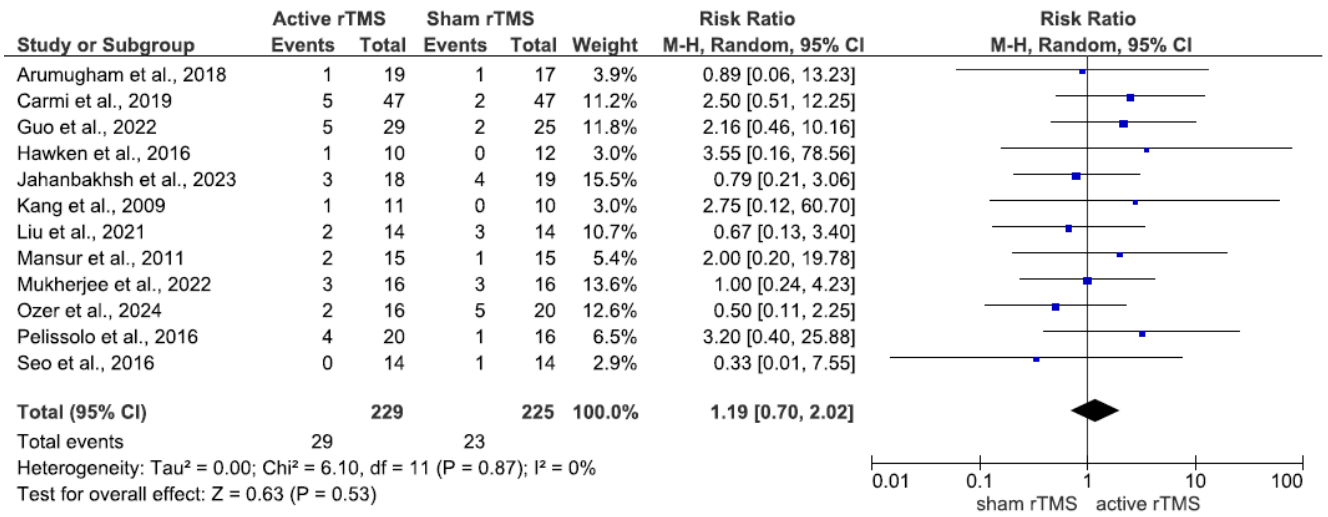
Supplementary Figure S7 Treatment response based on Y-BOCS ≥35% + CGI-I 1–2



rTMS = repetitive transcranial magnetic stimulation; RR = risk ratio; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

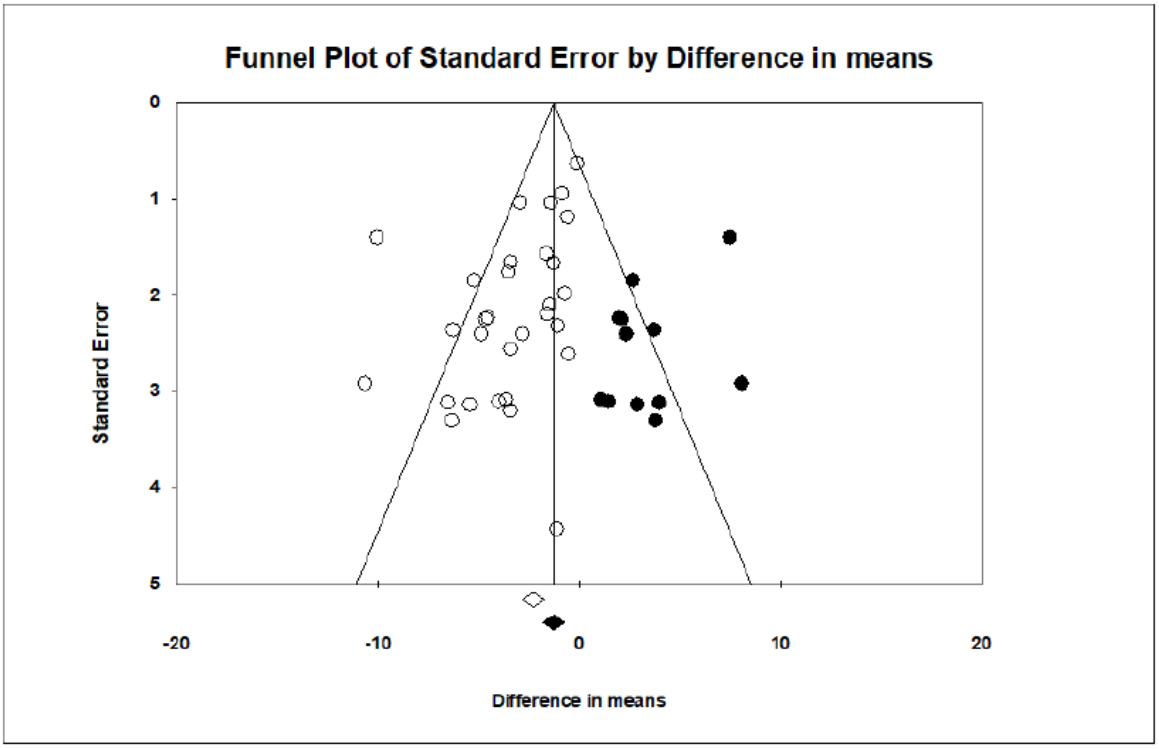
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Supplementary Figure S8 Dropout rate



rTMS = repetitive transcranial magnetic stimulation; RR = risk ratio; I² = inconsistency index; P = p-value; Chi² = chi-square test; Tau² = between-study variance; Z = test for overall effect.

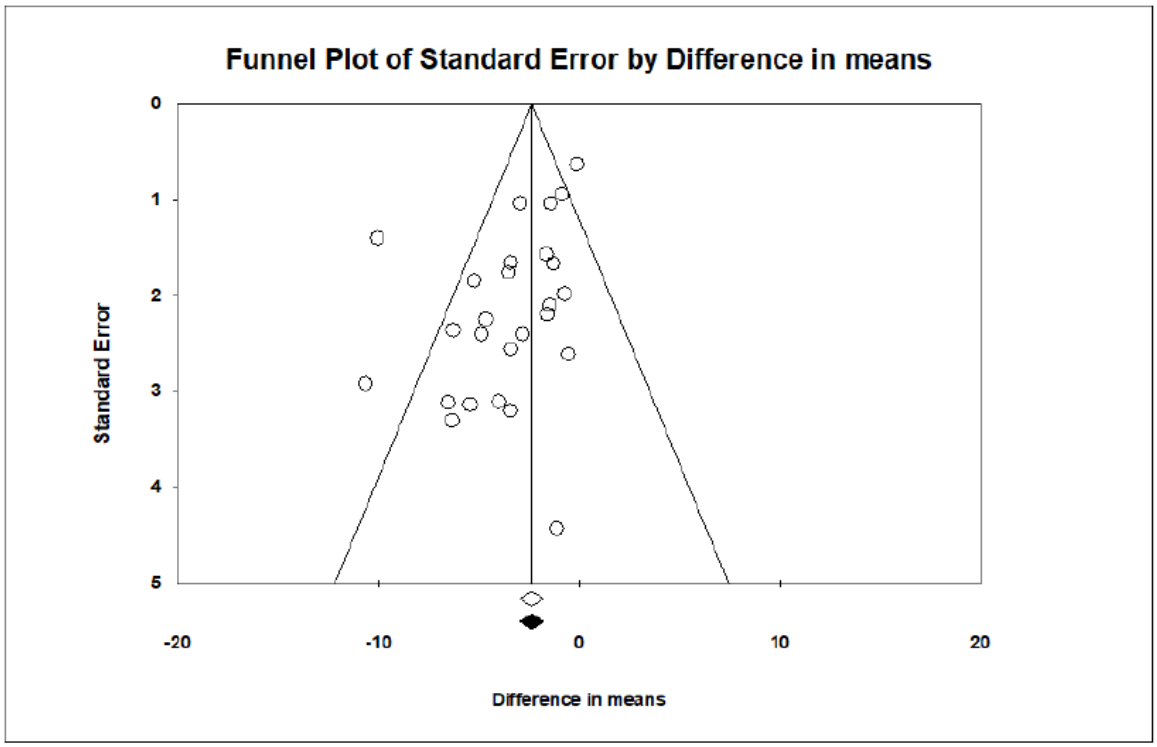
Supplementary Figure S9 Pre- and post-rTMS funnel plot



On the vertical axis, the standard error of the estimated effect from each study is represented, while the horizontal axis shows the difference in means between groups. In the absence of bias, studies are expected to distribute symmetrically around the global effect estimate, forming a pattern resembling an inverted funnel. Studies with higher precision (lower standard error) tend to cluster at the top of the plot, close to the pooled effect, while less precise studies (higher standard error) are distributed more widely at the base.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Figure S10 Pre- and post-rTMS funnel plot after excluding high risk of bias studies



The vertical axis represents the standard error of the estimated effect of each study, while on the horizontal axis represents the difference in means between groups. In the absence of bias, studies are expected to distribute symmetrically around the global effect estimate, forming a pattern resembling an inverted funnel. Studies with higher precision (lower standard error) tend to cluster at the top of the plot, close to the pooled effect, while less precise studies (higher standard error) are distributed more widely at the base.

Supplementary Table S3 Results of univariate meta-regression analyses for potential moderators of the effect of rTMS on Y-BOCS score

Moderator	Coefficient (β)	95%CI	p-value	I^2 residual
Y-BOCS baseline	-0.46	-0.88; -0.04	0.03	0.47
Targeting	0.36	-4.32; 5.03	0.88	-0.04
Coil type	2.35	-3.82; 8.52	0.46	-0.10
Targeting/coil type	2.36	-3.91; 8.63	0.46	-0.15

Y-BOCS = Yale Brown Obsessive-Compulsive Scale.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Table S4 Comparison of predictive moderators of rTMS response in obsessive-compulsive disorder across meta-analyses

Meta-analysis	No. of RCTs	Search period	Moderators tested	Significant predictors of response
Fitzsimmons et al.[32]	15	Up to February 2022	Adjunctive psychotherapy, treatment resistance, sham type, number of sessions.	None
Grassi et al.[33]	31	Up to December 2022	Age, % female, number of sessions, total number of stimulation sessions, stimulation frequency.	None
Pellegrini et al.[34]	23	Up to July 2021	Age, % female, baseline anxiety severity, baseline OCD severity, OCD duration, baseline depression (HAM-D), baseline depression (MADRS).	Baseline depression severity (HAM-D) (F=6.92, p=0.04)
Perera et al.[35]	26	Up to October 2020	Cortical target, rTMS frequency, Total of pulses per session, and treatment duration.	None
Thatikonda et al.[36]	20	Up to July 2021	Improvement in OCD symptoms in anxiety symptoms and depressive symptoms.	Y-BOCS reduction: Anxiety improvement (β=0.33, p=0.01)
Zhou et al.[37]	20	Up to September 2016	Frequency, Sessions, Total pulses, Weeks, Mean age, Duration of illness, % RMT, % female, total pulses per session, baseline Y-BOCS score, illness onset, inter-train interval, trains per session, duration of a single train	None
Present study	31	Up to September 2024	Mean age, number of women and men, disease duration, comorbidity, country, original culture of the study, acceptance of non-conventional treatments, baseline mean Y-BOCS score in the active group, frequency, intensity, number of sessions and pulses, blinding, sham technique, coil type, targeting, provocation/ exposure and response prevention, and design	Baseline Y-BOCS mean of the active group (coef. = -0.46, p = 0.031)

HAM-D= Hamilton Depression Rating Scale; MADRS = Montgomery-Åsberg Depression Rating Scale; OCD = obsessive-compulsive disorder; RCT = randomized controlled trial; RMT% = resting motor threshold; rTMS = repetitive Transcranial Magnetic Stimulation; Y-BOCS= Yale Brown Obsessive-Compulsive Scale.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Figure S11 Quality of Evidence (GRADE)

Author(s):
Question: RTMS compared to Sham for OCD
Setting:
Bibliography:

Certainty assessment							№ of patients		Effect		Certainty	Importance
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	rTMS	Sham	Relative (95% CI)	Absolute (95% CI)		
Y-BOCS												
29	randomised trials	serious[a]	serious[a,b]	not serious	serious[c,d]	publication bias strongly suspected strong association	474	403	-	MD **3.3 higher** (4.55 lower to 2.04 lower)	⨁◯◯◯ Very low[a,b,c,d]	CRITICAL
Anxiety												
26	randomised trials	serious	not serious	not serious	not serious	none	357	293	-	SMD **0.39 SD lower** (0.54 lower to 0.23 lower)	⨁⨁⨁◯ Moderate	IMPORTANT
Depression												
27	randomised trials	serious[e,f,g,h]	not serious	not serious	not serious	none	329	287	-	SMD **0.34 SD lower** (0.5 lower to 0.18 lower)	⨁⨁⨁◯ Moderate[e,f,g,h]	IMPORTANT

CI: confidence interval; **MD:** mean difference; **SMD:** standardised mean difference

Explanations

a. We downgraded the certainty of evidence by one level due to serious risk of bias because the 31 included RCTs, 6 were rated as having high risk of bias and 13 as unclear, particularly regarding randomization procedures, selective reporting, and deviations from intended interventions. This proportion of studies with methodological concerns reduces the overall confidence in the pooled effect estimates
b. We downgraded the certainty of evidence by one level due to serious inconsistency. The pooled analysis showed substantial heterogeneity (I^2 = 68%), indicating considerable variability in treatment effects across trials. Although the direction of effect was generally consistent (favoring rTMS over sham), the magnitude varied across studies, reducing confidence in the precision and stability of the overall estimate.
c. We downgraded the certainty of the evidence by one level due to serious imprecision. Although the pooled effect favored rTMS over sham, the 95% confidence interval was wide (MD = -3.30, 95% CI: -4.55 to -2.04), indicating uncertainty about the exact magnitude of the treatment effect. This range includes values close to the lower threshold of clinical relevance, limiting confidence in the precision of the estimate.
d. We did not downgrade the certainty of the evidence for this indirectness, as the included studies directly addressed the research question. All trials evaluated the target population (adult patients with OCD), the intervention of interest (rTMS), the appropriate comparator (sham stimulation), and the primary outcome (change in Y-BOCS scores). Therefore, no relevant concerns regarding applicability or mismatch between the research question and the available evidence were identified.
e. We downgraded the certainty of the evidence by one level due to strongly suspected publication bias. The Egger's regression test indicated significant asymmetry (intercept = -1.71, 95% CI: -2.83 to -0.59, p = 0.004), suggesting small-study effects and possible selective reporting. This raises concerns that the pooled estimate may overstate the true effect size.
f. We did not downgrade for inconsistency because heterogeneity was negligible. For both anxiety and depression outcomes, the I^2 statistic was 0%, indicating that the effect estimates were highly consistent across studies.
g. We did not downgrade for imprecision because the 95% confidence intervals were narrow and did not cross the null effect. For anxiety (95% CI: −0.54 to −0.23) and depression (95% CI: −0.50 to −0.18), the estimates were precise and consistently favored the active intervention.
h. We did not downgrade for Egger's regression test indicated no significant small-study effects for anxiety (intercept: -0.09; 95% CI: -1.85 to 1.68; p = 0.921) or depression (intercept: -0.50; 95% CI: -1.67 to 0.67; p = 0.39). The symmetrical distribution of studies in the funnel plots supports the absence of significant publication bias for these outcomes.

MD = mean deviation; OCD = obsessive-compulsive disorder; rTMS = repetitive transcranial magnetic stimulation; SMD = standardized mean deviation.

http://doi.org/10.47626/1516-4446-2025-4515

Supplementary Table S5 Summary of findings table

Outcome (comparison rTMS vs sham)	95%CI	Absolute Effect	NNT	Plain Language Statement
Y-BOCS total score	MD -3.30 (95% CI: -4.55; -2.04)	≈12.2% improvement from baseline (27.0 points)	6	rTMS produced a small but significant reduction in OCD severity, although this change may be below contemporary thresholds for clinical relevance.
Anxiety symptoms	SMD -0.39 (95% CI: -0.54; -0.23) → ≈ -2.3 points on HAM-A	Small reduction	Not calculated	rTMS led to a consistent but modest reduction in anxiety symptoms (~2 points on HAM-A) that was below thresholds usually considered clinically meaningful
Depression symptoms	SMD -0.34 (95% CI: -0.50; -0.18) → ≈ -1.8 points on HAM-D	Small reduction	Not calculated	rTMS produced a modest improvement in depressive symptoms (~1.8 points on HAM-D), which was statistically reliable but of limited clinical magnitude.

HAM = Hamilton Depression Rating Scale; MD = mean deviation; NNT = number needed to treat; OCD = obsessive-compulsive disorder; rTMS = repetitive transcranial magnetic stimulation; SMD = standardized mean deviation; Y-BOCS = Yale Brown Obsessive-Compulsive Scale.

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