

Supplementary Table S4: Risk-of-bias and quality assessment for all 44 included studies, rated using the NIH quality as-sessment tool. Supplementary Figure S1: Resting-state theta band connectivity differences between MS patients and HCs

Study ID	1. Was the research question or objective in this paper clearly stated?	2. Was the study population clearly specified and defined?	3. Was the participation rate of eligible persons at least 50%?	4. Were all the subjects selected or recruited from the same or similar populations (including the same time period)? Were inclusion and exclusion criteria for being in the study pre-specified and applied uniformly to all participants?	5. Was a sample size justification, power description, or variance and effect estimates provided?	6. For the analyses in this paper, were the exposure(s) of interest measured prior to the outcome(s) being measured?	7. Was the time frame sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	8. Did the study examine different levels of the exposure (e.g., lesion load, disability severity)?	9. Were exposure measures (e.g., MS diagnosis) valid and reliable?	10. Was the exposure(s) assessed more than once over time?	11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	12. Were the outcome assessors blinded to the exposure status of participants?	13. Was loss to follow-up after baseline 20% or less?	14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	total scores	Quality rating: good (11-14 points) or fair (7.5-10.5 points) or poor (0-7 points)
Akbarian 2023	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Akbarian 2024	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Akbarian 2025	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Arpin 2017	Yes	Yes	NR	Yes	Yes	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9.5	Fair
Arpin 2017 (2)	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Arpin 2018	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Barratt 2017	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Costers 2020	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Cover 2006	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	Yes	N/A	Yes	10	Fair
Cipriano 2023	Yes	Yes	NR	Yes	Yes	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9.5	Fair
Cipriano 2024	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Dell'Acqua 2009	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	Yes	N/A	Yes	10	Fair
Georgopoulos 2007	Yes	Yes	NR	Yes	No	No	No	No	Yes	No	Yes	NR	N/A	Yes	8.5	Fair
Hagiwara 2010	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Hardmeier 2012	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Has Silemek 2023	Yes	Yes	NR	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	Yes	11.5	Good
Karhu 1992	Yes	Yes	NR	Yes	No	No	No	No	Yes	No	Yes	NR	N/A	No	8	Fair
Kassubek 1999	Yes	Yes	NR	Yes	No	No	No	No	Yes	No	Yes	NR	N/A	No	8	Fair
Kim 2018	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Kim 2020	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Kotini 2007	Yes	Yes	NR	Yes	No	No	No	No	Yes	No	Yes	NR	N/A	No	8	Fair
Kulik 2021	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Mazzara 2025	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Nauta 2020	Yes	Yes	NR	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	NR	No	Yes	11	Good
Nauta 2024	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	13	Good
Nij Bijvank 2021	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Paolicelli 2021	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Rossi 2024	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Sanders 2025	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Schoonheim 2013	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Schoonhoven 2019	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	Yes	N/A	Yes	10	Fair

Simon 2023	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	Yes	N/A	Yes	10	Fair
Sjøgård 2020	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Sorrentino 2024	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Stickland 2019	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Tewarie 2013	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Tewarie 2014	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Tewarie 2014 (1)	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Tewarie 2014 (2)	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Tewarie 2017	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Van der meer 2013	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Van Schependoom 2019	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Van Schependoom 2021	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair
Waldman 2020	Yes	Yes	NR	Yes	No	No	No	Yes	Yes	No	Yes	NR	N/A	Yes	9	Fair