Online Supplementary materials

Table S1: rTMS effects in clinical populations (after Wassermann and Zimmermann, 2012)

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| Population | Effects |
| Depression | rTMS at DLPFC yields a medium to large effect size on reducing the severity of depressive symptoms. |
| Schizophrenia | Low-frequency rTMS significantly reduces intensity of auditory hallucinations but is less efficient in improving negative symptoms. |
| Obsessive compulsive disorder (OCD) | High-frequency rTMS may reduce compulsions; the finding has not been replicated consistently across studies. |
| Posttraumatic stress disorder (PTSD) | High-frequency rTMS may have positive and sustainable therapeutic effects on anxiety. |
| Parkinson’s Disease (PD) | High-frequency rTMS may have beneficial effects on motor disorders |
| Alzheimer disease (AD) | High-frequency, offline rTMS may contribute to small short-term improvement in cognitive functioning |

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| Table S2: Search syntax**AMED (Allied and Complementary Medicine) 1985 to May 2016** | | |
| **#** | **Searches** | **Results** |
| **1** | transcranial magnetic stimulation.mp. | 287 |
| **2** | TMS.mp. | 116 |
| **3** | Theory of mind.mp. | 56 |
| **4** | ToM.mp. | 25 |
| **5** | mentali\*.mp. | 20 |
| **6** | role taking.mp. | 3 |
| **7** | perspective taking.mp. | 5 |
| **8** | empathy.mp. | 343 |
| **9** | 1 or 2 | 313 |
| **10** | 3 or 4 or 5 or 6 or 7 or 8 | 429 |
| **11** | **9 and 10** | **1** |

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| **Cochrane Library: Issue 4 of 12, April 2016; Cochrane Central Register of Controlled** | | |
| **#** | **Searches** | **Results** |
| #1 | transcranial magnetic stimulation | 2024 |
| #2 | TMS | 796 |
| #3 | Theory of mind | 659 |
| #4 | ToM | 164 |
| #5 | mentali\* | 96 |
| #6 | role taking | 800 |
| #7 | perspective taking | 176 |
| #8 | empath\* | 453 |
| #9 | #1 or #2 | 2235 |
| #10 | #3 or #4 or #5 or #6 or #7 or #8 | 2233 |
| #11 | #9 and #10 | 6 |

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| **OVID: Embase 1980 to 2016 Week 21** | | |
| **#** | **Searches** | **Results** |
| **1** | transcranial magnetic stimulation.mp. | 18219 |
| **2** | TMS.mp. | 12740 |
| **3** | Theory of mind.mp. | 4908 |
| **4** | ToM.mp. | 3625 |
| **5** | mentali\*.mp. | 3749 |
| **6** | role taking.mp. | 164 |
| **7** | perspective taking.mp. | 1354 |
| **8** | empath\*.mp. | 23301 |
| **9** | 1 or 2 | 23283 |
| **10** | 3 or 4 or 5 or 6 or 7 or 8 | 33707 |
| **11** | **9 and 10** | **128** |
|  |  |  |
| **OVID MEDLINE(R) 1946 to May Week 2 2016** | | |
| **#** | **Searches** | **Results** |
| **1** | transcranial magnetic stimulation.mp. | 10734 |
| **2** | TMS.mp. | 7672 |
| **3** | Theory of mind.mp. | 3010 |
| **4** | ToM.mp. | 2291 |
| **5** | mentali\*.mp. | 2406 |
| **6** | role taking.mp. | 151 |
| **7** | perspective taking.mp. | 857 |
| **8** | empath\*.mp. | 18755 |
| **9** | 1 or 2 | 13734 |
| **10** | 3 or 4 or 5 or 6 or 7 or 8 | 25376 |
| **11** | **9 and 10** | **59** |

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| **OVID: PsycINFO 1806 to May Week 3 2016** | | |
| **#** | **Searches** | **Results** |
| **1** | transcranial magnetic stimulation.mp. | 7371 |
| **2** | TMS.mp. | 3724 |
| **3** | Theory of mind.mp. | 7047 |
| **4** | ToM.mp. | 3343 |
| **5** | mentali\*.mp. | 5698 |
| **6** | role taking.mp. | 2669 |
| **7** | perspective taking.mp. | 3265 |
| **8** | empath\*.mp. | 26113 |
| **9** | 1 or 2 | 7824 |
| **10** | 3 or 4 or 5 or 6 or 7 or 8 | 42782 |
| **11** | **9 and 10** | **65** |
|  |  |  |
| **Pubmed 25052016** | | |
| **#** | **Searches** | **Results** |
| #1 | Search (transcranial magnetic stimulation) OR TMS | 16057 |
| #2 | Search **(((((theory of mind) OR mentali\*) OR empath\*) OR perspective taking) OR role taking) OR ToM** | 61634 |
| #3 | Search (#1) AND #2 | 131 |

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| **Web of Science Core Collection: Citation Indexes: Science Citation Index Expanded (SCI-EXPANDED) --1900-present; Social Sciences Citation Index (SSCI) --1956-present; Arts & Humanities Citation Index (A&HCI) --1975-present; Conference Proceedings Citation Index- Science (CPCI-S) --1990-present; Conference Proceedings Citation Index- Social Science & Humanities (CPCI-SSH) --1990-present** | | |
| **#** | **Searches** | **Results** |
| #1 | "transcranial magnetic stimulation" | 16137 |
| #2 | TMS | 13326 |
| #3 | "Theory of mind" | 5489 |
| #4 | ToM | 10802 |
| #5 | mentali\* | 6906 |
| #6 | "role taking" | 436 |
| #7 | "perspective taking" | 3171 |
| #8 | empath\* | 18938 |
| #9 | #1 or #2 | 23415 |
| #10 | #3 or #4 or #5 or #6 or #7 or #8 | 41869 |
| #11 | #9 and #10 | 116 |

Table S3: The list of the excluded studies

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| **Excluded due to the type of publication** |
| Agnew, Z. K., Bhakoo, K. K., & Puri, B. K. (2007). The human mirror system: A motor resonance theory of mind-reading. Brain Research Reviews, 54(2), 286-293. doi: 10.1016/j.brainresrev.2007.04.003 |
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| **Table S4. Component and overall quality ratings of the reviewed studies** | | | | | | | |
| **Study** | **Selection bias** | **Study design** | **Confounders** | **Blinding** | **Data collection method** | **Withdrawals and dropouts** | **Overall** | |
| Balconi & Bortolotti, 2012 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Balconi & Bortolotti, 2013 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Balconi, Bortolotti, & Gonzaga, 2011 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Balconi & Canavesio, 2013 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Balconi & Canavesio, 2016 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Balconi, Crivelli, & Bortolotti, 2010 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Bolognini et al., 2013 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Costa et al., 2008 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Enticott et al., 2014 | ++ | +++ | +++ | +++ | +++ | +++ | +++ | |
| Giardina et al., 2011 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Hoekert et al., 2010, | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Kalbe et al., 2010 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Keuken et al., 2011 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Krause et al., 2012 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Lev-Ran et al., 2012 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Michael et al., 2014 | + | +++ | +++ | ++ | + | +++ | + | |
| Pobric and Hamilton, 2006 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Schuwerk et al., 2014 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| Silani et al., 2013 | + | +++ | + | ++ | +++ | +++ | + | |
| Uddin et al., 2006 | + | +++ | +++ | ++ | ++ | +++ | ++ | |
| Young et al., 2010 | + | +++ | +++ | ++ | +++ | +++ | ++ | |
| + = weak, ++ = moderate, +++ = strong | | | | | | | |

**Figure S1.** **Study Selection and Search Results**

Removal of 254 duplicates

18 papers (25 trials) included in the meta-analysis

Search results = 506 hits

Embase - 128

Pubmed - 131

PsycInfo - 65

Medline - 59

AMED - 1

Cochrane library - 6

Web of Science - 116

Hand search articles - 2

Grey literature - 0

Total hits = 254 articles were screened after reviewing titles, abstracts, and full-texts

Reasons for exclusion:

174 publications were rejected by title and abstract

20 articles were removed due to their publication type

12 studies did not used rTMS

22 studies did not used behavioural measures

4 studies used irrelevant outcome measures

22 papers subjected to quality assessment systematic review

4 publications were not eligible for meta-analysis due to unavailable data after contacting corresponding authors



Figure S2a. Funnel plot of cognitive ToM trials included in the meta-analysis



Figure S2b. Filled funnel plot of the cognitive ToM trials in the meta-analysis after trim procedure

Empty dots with an outer square represent imputed missing trials.

Abbreviations: s.e., standard error of mean effect size

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Figure S3a. Funnel plot of the affective ToM trials in the meta-analysis



Figure S3b. Filled funnel plot of the affective ToM trials in the meta-analysis after trim procedure

No missing trials were found.

Abbreviations: s.e., standard error of mean effect size