Psychological Medicine

cambridge.org/psm

Effects of metacognitive training (MCT) on social cognition for schizophrenia spectrum and related psychotic disorders: a systematic review and meta-analysis

Adèle Hotte-Meunier[1,2], Danielle Penney[1,3], Daniel Mendelson[1,2], Élisabeth Thibaudeau[1,4], Steffen Moritz[5], Martin Lepage[1,4] and Geneviève Sauvé[1,6]

[1]Douglas Mental Health University Institute, Montreal, Canada; [2]Department of Psychology, McGill University, Montreal, Canada; [3]Department of Psychology, Université du Québec à Montréal, Montreal, Canada; [4]Department of Psychiatry, McGill University, Montreal, Canada; [5]Department of Psychiatry and Psychotherapy, University Medical Centre Hamburg, Hamburg, Germany and [6]Department of Education and Pedagogy, Université du Québec à Montréal, Montreal, Canada

Original Article

Cite this article: Hotte-Meunier A, Penney D, Mendelson D, Thibaudeau É, Moritz S, Lepage M, Sauvé G (2024). Effects of metacognitive training (MCT) on social cognition for schizophrenia spectrum and related psychotic disorders: a systematic review and meta-analysis. *Psychological Medicine* **54**, 914–920. https://doi.org/10.1017/S0033291723002611

Received: 28 June 2022
Revised: 5 July 2023
Accepted: 10 August 2023
First published online: 29 September 2023

Keywords:
emotion processing; metacognition; psychosis; theory of mind

Corresponding author:
Geneviève Sauvé;
Email: sauve.genevieve@uqam.ca

Abstract

Background. Individuals with schizophrenia spectrum and related psychotic disorders (SSD) experience significant impairments in social cognition that impede functioning. Social cognition is a multidimensional construct consisting of four domains: 1. theory of mind, 2. emotion processing, 3. attributional style and 4. social perception. Metacognitive training (MCT) is an intervention designed to target cognitive biases in psychosis containing two modules addressing social cognition.

Methods. A systematic review and meta-analysis was conducted to investigate the effects of MCT on social cognition and two of its domains: theory of mind and emotion processing. Ten electronic databases were scoured from 2007 to 1 February 2022 for MCT studies reporting social cognition outcomes for people with SSD (1050 identified, 282 assessed). Effect sizes were calculated using Cohen's d in R.

Results. Nine studies were included in the meta-analysis ($n_{MCT} = 212$, $n_{control} = 194$). MCT had a small but positive effect on global social cognition ($d = 0.28$ [95% CI 0.07–0.49]) and theory of mind ($d = 0.27$ [95% CI 0.01–0.52]). MCT showed no evidence of an effect on emotion processing ($d = 0.03$ [95% CI −0.26 to 0.32]).

Conclusion. MCT has a small but significant effect on social cognition for people with SSD. Our results add to other recent meta-analyses showing significant effects of MCT on clinically relevant outcomes such as positive symptoms, cognitive biases and cognitive insight. We recommend that future studies on MCT report outcomes on all four domains of social cognition.

Trial Registration. PROSPERO (in the process of registration) available at https://www.crd.york.ac.uk/prospero/#recordDetails

Introduction

Individuals with schizophrenia spectrum and related psychotic disorders (SSD) experience significant deficits in social cognition that impede functioning, close relationships, employment and parenting (Fett et al., 2011; Han & Jun, 2020; Mehta, Bhagyavathi, Kumar, Thirthalli, & Gangadhar, 2014; Moran, 2013). Specifically, individuals with SSD tend to have significant difficulties in identifying and expressing complex emotions, understanding the mental states and intentions of others, making sense of everyday social interactions and interpreting nonverbal social cues (Pinkham et al., 2014). Studies have found that these deficits in social cognition are a greater predictor of unemployment than psychotic symptoms (Han & Jun, 2020) and account for a significant amount of variance in interpersonal skills (26%, Pinkham and Penn, 2006) and global functioning (16%, Fett et al., 2011). Moreover, although people with SSD value social relationships just as highly as people without SSD (Blanchard, Park, Catalano, & Bennett, 2015; Gard et al., 2014), individuals with SSD face significant social and social cognition barriers that lead to fewer interpersonal relationships and smaller social networks (Horan et al., 2006; Weittenhiller, Mikhail, Mote, Campellone, and Kring, 2021). This presents a critical issue as social relationships are significantly related to clinical outcomes such as symptom severity and functioning (Hooker, 2015; Horan et al., 2006).

Social cognition is broadly defined as the 'unique [cognitive] processes that enable human beings to interpret social information and behave appropriately in a social environment' (Shany-Ur & Rankin, 2014). Previously, the Measurement and Treatment Research to

Improve Cognition in Schizophrenia (MATRICS) initiative included social cognition with other neurocognition measures such as processing speed, attention and vigilance, working memory, verbal learning and memory, visual learning and memory and reasoning and problem solving (Nuechterlein et al., 2004).

Recent studies have further defined social cognition as a multidimensional construct independent of neurocognition (Pinkham, 2014; Pinkham & Penn, 2006) that has an equal or greater impact than neurocognition on functioning for people with SSD (Fett et al., 2011; Pinkham & Penn, 2006; Schmidt, Mueller, & Roder, 2011). Thus, social cognition stands as an important treatment target for this clinical population.

There has been much debate as how to best deconstruct social cognition into discrete domains. Recently, a panel of experts conducted the Social Cognition Psychometric Evaluation (SCOPE) study and ascertained the four core domains of social cognition in schizophrenia research as 1. theory of mind (the ability to represent and infer the intentions and emotions of others), 2. emotion processing (the ability to perceive and use emotion-related information), 3. attributional style (the way someone makes sense of positive and negative social events) and 4. social perception (the ability to decode and interpret social cues). Social cognition is now routinely categorized in this manner in schizophrenia research (Barbato et al., 2015; Javed & Charles, 2018; Pinkham et al., 2014).

Given its clinical importance, several evidence-based interventions such as metacognitive training (MCT, developed by Moritz and Woodward, 2007) have included social cognition as one of their treatment targets. MCT is a psychoeducational intervention consisting of eight to ten modules mainly targeting cognitive biases (see eTable 1). Specifically, modules 4 and 6 of MCT target social cognition and empathy using theory of mind and emotion perception exercises. The primary aim of MCT is to have participants become aware of the presence and fallacy of certain maladaptive thought patterns; the secondary aim is to provide alternative coping and information-processing strategies (Moritz et al., 2013; University Medical Center Hamburg-Eppendorf, 2021).

Although the first meta-analyses on MCT concluded little to no benefits to those with SSD (Jiang, Zhang, Zhipei, Wei, & Chunbo, 2015; van Oosterhout et al., 2016), recent meta-analyses support the use of MCT in reducing positive symptoms and improving cognitive insight for people with SSD (Eichner & Berna, 2016; Liu, Tang, Hung, Tsai, & Lin, 2018; Lopez-Morinigo et al., 2020; Philipp et al., 2019; Sauvé et al., 2020). A recent meta-analysis by our group (Penney et al., 2022) established the effectiveness and durability of MCT on reducing delusions, hallucinations, negative symptoms and cognitive biases as well as improving functioning and self-esteem for up to one year following the intervention. This present meta-analysis is an extension of the forerunner study to investigate the effects of MCT on global social cognition and two of its domains: theory of mind and emotion processing. Although many MCT studies report social cognition outcomes, to our knowledge, the effects of MCT on social cognition have not yet been assessed in a meta-analysis. The objective of this meta-analysis is to quantify and evaluate the effects of MCT on social cognition.

Past research has already established a relationship between metacognition and social cognition deficits (Lysaker et al., 2021). Moreover, other metacognition interventions demonstrated significant improvements in social cognition and other related social outcomes (Kukla & Lysaker, 2020). Thus, we hypothesize that there will be a significant effect in favor of MCT on global social cognition, theory of mind and emotion processing.

Methods

The protocol for this meta-analysis is registered on the PROSPERO (submitted for registration) and Open Science Framework (OSF) databases. The 2020 PRISMA guidelines were followed (checklists and flowchart can be found in eAppendix A–C, respectively).

Search strategy and selection criteria

The literature search and screening began on 3 June 2021 by members of our research team. An initial search was conducted with keywords schizo* OR delusion* OR psychosis OR psychoses OR psychotic* OR first episode* OR first-episode* OR fep* AND metacognitive' NEXT train* OR 'meta-cognitive' NEXT train* (for more details, see Penney et al., 2022).

Given our interest in social cognition outcomes, we conducted a second search for the purpose of this meta-analysis in January 2022. The key words 'metacognitive training' AND 'social cogn*' OR 'cogn*' AND 'schiz*' were computed into the same ten databases: Cochrane Central Register of Controlled Trials (CENTRAL), Cumulative Index to Nursing and Allied Health Literature (EBSCO), Embase (Ovid), MEDLINE (Ovid), PsycINFO (Ovid), PubMed, Social Work Abstracts (Ovid) and Web of Science. The search was supplemented with a gray literature search using the OpenGrey and ProQuest Dissertations databases.

The search spanned from November 2007 (after the first MCT study was published by Moritz & Woodward) until 1 February 2022. No study language restrictions were placed; foreign language works were translated using the online translator Deepl and members of our team interpreted records in English, French, German and Spanish.

The only inclusion criterion for participants was a diagnosis of SSD (see eTable 2 for acceptable diagnoses). There were no age, sex, gender, race, ethnicity, medication, comorbid diagnosis or substance use exclusion criteria. Eligible studies included randomized controlled trials (RCTs), quasi-experimental studies and cohort studies published in peer-reviewed journals. Included studies had to compare MCT to a passive control (e.g. waitlist condition) or active control condition (e.g. treatment as usual, cognitive behavioral therapy, psychoeducation).

Included studies were required to administer the original version or accepted adaptations of group MCT or individualized metacognitive training (MCT +) for psychosis. Acceptable adaptations included variability in the number of sessions given and the duration of sessions. Studies had to report the sample sizes, means and standard deviations for at least one social cognition outcome for both the treatment and control conditions. In the case that means and standard deviations were not reported, listed corresponding authors were contacted by email.

Data were extracted and coded using a piloted template developed by co-author GS. Using this template, four reviewers (AHM, DP, DM, ÉT) extracted the data and the first author completed quality control. Discrepancies were resolved by majority agreement among authors.

Data synthesis procedure

Studies were deemed eligible for quantitative synthesis if they reported the sample sizes, means and standard deviations for

https://doi.org/10.1017/S0033291723002611 Published online by Cambridge University Press

pre- and post-treatment outcome measures for both the treatment and control conditions.

Selected outcomes were synthesized using the Metafor (version 2.4), Shiny (version 1.4) and Ggplot2 (version 3.3.6) packages in R. A global social cognition meta-analysis was first completed. Subsequently, separate meta-analyses were conducted for two domains of social cognition: theory of mind and emotion processing. Measures of effect size were calculated using Cohen's d with a 95% confidence interval and a random-effects model was applied for each meta-analysis. To avoid nested effect sizes of multiple outcomes within the same study (Cheung, 2019), effect sizes were averaged by study. Results for the meta-analyses are illustrated with forest plots.

Methodological quality assessment

The methodological quality assessment was evaluated using the most recent version of the Mixed Methods Appraisal Tool by AHM, DP and DM (MMAT; Hong et al., 2018). The heterogeneity of effect sizes across studies was estimated with Cochran's *Q* test and the I^2 statistic for each meta-analysis. Risk of publication bias was assessed for each meta-analysis with Eggers' asymmetry test, Kendall Tau's rank correlation test for funnel plot asymmetry and a visual evaluation of the funnel plot.

Since participant drop-out was common across studies, a sensitivity analysis compared results using the lower and upper bound sample sizes. A second sensitivity analysis restricted study design to RCTs to verify the impact of study design on our results.

Results

Based on the aforementioned inclusion and exclusion criteria, 1050 papers were identified and 282 were assessed. Nine studies were deemed eligible for the meta-analysis for a cumulative total of 29 social cognition outcomes (see eTable 2). Of these nine studies, six were RCTs, two were quasi-experimental studies and one was a cohort study. The key characteristics of each included study are outlined in eTable 2. Based on the included studies, we conducted three separate meta-analyses on social cognition and two of its subdomains: theory of mind and emotion processing (there was insufficient data for social perception and attributional style).

Effect of MCT on global social cognition

Nine studies ($n_{MCT} = 212$, $n_{control} = 194$) reporting a total of 29 global social cognition (including theory of mind, emotion processing and attributional style) outcome measures were included in this first meta-analysis. As illustrated in Fig. 1, the benefits of MCT on global social cognition had a small to moderate, but significant, effect size ($d = 0.28$ [95% CI 0.07–0.49]), $\beta = 0.99997$.

Further analyses suggest that there was variation across studies, as indicated by the Cochran's *Q* test ($Q(8) = 7.57$, $p = 0.58$). Moreover, there was slight heterogeneity in effect sizes ($I^2 = 12.18\%$). The Egger's test, ($t(7) = 0.03$, $p = 0.98$) and Kendall Tau's rank correlation test for funnel plot asymmetry (τ: 0.00, $p = 1.00$) corroborate the conclusion drawn from the visual analysis of the funnel plot that the risk of publication bias was very low (see eFig. 3 in online supplement).

The first sensitivity analysis on sample size concluded no significant change and the conservative sample size estimates were retained in all analyses. The second sensitivity analysis restricting study design to RCTs for global social cognition included six studies for a total of twelve outcome measures. The results of this sensitivity analysis were no longer significant after limiting to RCTs and controlling for nested effects sizes ($d = 0.2$ [95% CI −0.02 to 0.43] – see eFig. 4 in the online supplement).

Effect of MCT on theory of mind

Eight studies ($n_{MCT} = 193$, $n_{control} = 174$) reporting a cumulative total of 15 theory of mind outcome measures were included in

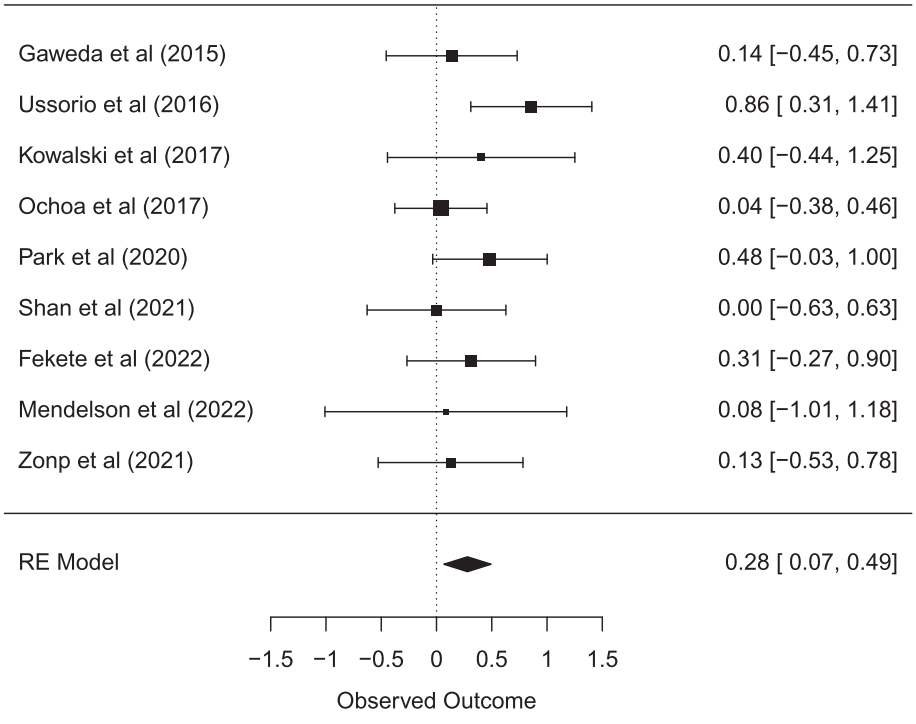

Figure 1. Forest plot for global social cognition.

https://doi.org/10.1017/S0033291723002611 Published online by Cambridge University Press

this second meta-analysis. As illustrated in Fig. 2, the benefits of MCT on theory of mind had a small to moderate significant effect size ($d = 0.27$ [95% CI 0.01–0.52]), $\beta = 0.99998$.

Further analyses suggest that there were moderate levels of variation across studies as indicated by Cochran's Q test ($Q(7) = 9.36$, $p = 0.23$). Furthermore, there was moderate heterogeneity in effect sizes ($I^2 = 31.99\%$). The Egger's test, ($t(6) = 0.21$, $p = 0.84$) and Kendall Tau's rank correlation test for funnel plot asymmetry (τ: −0.07, $p = 0.90$) corroborate the conclusion drawn from the visual analysis of the funnel plot that the risk of publication bias was very low (see eFig. 3 in online supplement).

The second sensitivity analysis restricting study design to RCTs for theory of mind included five studies for a total of nine outcome measures. The results of this sensitivity analysis were no longer significant after limiting to RCTs and controlling for nested effects sizes ($d = 0.21$ [95% CI −0.04–0.45] – see eFig. 4 in the online supplement).

Effect of MCT on emotion processing

Four studies ($n_{MCT} = 94$, $n_{control} = 86$) reporting a cumulative total of five emotion processing outcome measures were included in the third and last meta-analysis. There was no significant effect of MCT on emotion processing ($d = 0.03$ [95% CI −0.26–0.32]).

Further analyses suggest that there was variation across studies as indicated by Cochran's Q test ($Q(3) = 0.39$, $p = 0.94$). Furthermore, there was no heterogeneity in effect sizes ($I^2 = 0.00\%$). The Egger's test, ($t(2) = -0.64$, $p = 0.59$) and Kendall Tau's rank correlation test for funnel plot asymmetry (τ: −0.33, $p = 0.75$) corroborate the conclusion drawn from the visual analysis of the funnel plot that the risk of publication bias was high (see eFig. 3 in online supplement).

Certainty of evidence

The sensitivity analysis comparing upper and lower bound sample sizes concluded no significant changes. The conservative estimates of sample sizes were retained for calculating the meta-analyses presented in the current study. Although effect sizes remained similar after limiting the analysis to RCTs, statistical significance for global social cognition and theory of mind was not retained on the second sensitivity analysis on study design.

Discussion

The objective of this meta-analysis was to investigate the effects of MCT on social cognition and two of its domains: theory of mind and emotion processing in SSD. Results indicate that MCT has a significant positive effect on global social cognition and theory of mind. It remains to be seen whether these improvements in social cognition in turn translate to real-world social outcomes for people with SSD.

When interpreting these results, it is important to remain mindful of the intended purpose of MCT as an intervention mainly designed to reduce cognitive biases related to psychotic symptoms. Nevertheless, these preliminary results suggest that MCT may have direct and indirect positive effects on social cognition. In addition to the direct effects from modules 4 and 6 on social cognition, participating in other MCT sessions and training metacognition in multiple domains (as targeted in other modules such as attribution and jumping to conclusions) may help participants improve their ability to recognize cognitive biases and maladaptive thought patterns. This increased competence may be then transposed to social cognition.

MCT can be administered individually or in groups for individuals with a diagnosis of SSD. MCT is readily available online in a manualized PowerPoint format, free of charge and is currently accessible in thirty-seven languages. Additionally, MCT is a low-intensity intervention as it does not require administration by a psychologist or psychiatrist. Rather, MCT can be administered by social workers, nurses, therapists et cetera. MCT has been applied successfully in many countries, further vouching for the intervention's accessibility and cultural sensitivity

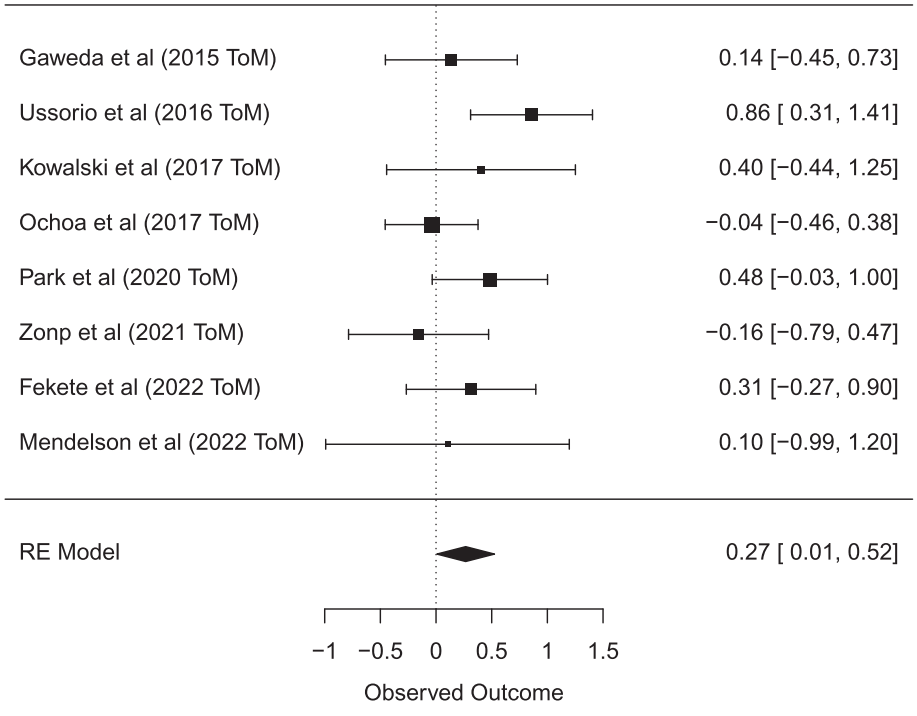

Figure 2. Forest plot for theory of mind.

https://doi.org/10.1017/S0033291723002611 Published online by Cambridge University Press

(Penney et al., 2022; University Medical Center Hamburg-Eppendorf, 2021). Specialized adaptations have also been developed for people with borderline personality disorder, major depressive disorder and obsessive-compulsive disorder (Jelinek et al., 2016, 2019; Schilling et al., 2018). Within the current context of the economic recession and the global healthcare crisis, MCT stands as a valuable intervention that is cost-effective, accessible, culturally sensitive and adaptable to many psychopathologies.

Thus, even if our effect sizes are modest at present, other benefits of MCT make this intervention a worthwhile and clinically relevant contribution to the treatment of psychosis. Combining MCT to other well-validated interventions such as social cognition skills training and social cognition and interaction training (d'Arma et al., 2021; Tang, Yu, Zhang, Fang, & Yuan, 2022; Yeo, Yoon, Lee, Kurtz, & Choi, 2022) may also enhance social cognition treatment plans.

Although the meta-analysis was sufficiently powered, results of individual studies included in the meta-analysis may have been underpowered by small sample sizes and high-quality active control conditions. The sample sizes varied from 5 to 48 participants in the included studies (mean $n = 23$). Moreover, the active control conditions that MCT was compared to were, for the most part, interventions reputed to improve social cognition: treatment-as-usual in a clinical setting, peer support groups (Castelein, Bruggeman, Davidson, & van der Gaag, 2015), psychoeducation approaches (Xia, Merinder, & Belgamwar, 2011) and action-based cognitive remediation therapy (Bowie, Grossman, Gupta, Holshausen, & Best, 2017). This could have diluted the effect sizes obtained in the present meta-analysis. Small sample sizes and the use of active control interventions as comparison points may have masked the stronger benefits of MCT on social cognition.

Moreover, a common issue in treating social cognition deficits is that there is no clear 'neurosignature' of SSD. Although social cognition deficits tend to be stable at the individual level, the breadth and depth of social cognition deficits vary widely across those with SSD (Bowie & Harvey, 2006). Therefore, it is unlikely that any intervention targeting social cognition will be equally as or even at all effective for every client presenting with a SSD diagnosis.

Lastly, it could be of interest to study the effects of MCT alongside other recent advancements in psychopharmacotherapy (i.e. oxytocin) and technology. Although the effects of oxytocin alone are somewhat mixed (Bürkner, Williams, Simmons, & Woolley, 2017; Horan and Green, 2019), Davis et al. (2014) concluded significant benefits of oxytocin on social cognition when combined with social cognition skills training for individuals with schizophrenia. Moreover, technological advances such as computerized interventions and portable devices have the added benefits of accessibility and repeated exposure in real-life settings (Horan & Green, 2019). On this point, the digital app 'COGITO' offers the MCT program package with the relabeled module 'Communication and Relationships' targeting social cognition. Whether this extension of MCT improves social cognition awaits to be tested in future studies.

Limitations

To begin with, analyses concluded that there was a slight risk of publication bias and moderate heterogeneity for the global social cognition and theory of mind meta-analyses. The application of a random-effects model over a fixed-effects model was chosen to mitigate part of the expected heterogeneity.

Second, it is important to bear in mind that meta-analyses are limited by the available studies that meet eligibility criteria. For this reason, social cognition outcomes by domain were unevenly distributed. Of the 29 social cognition outcomes included in this study, 15 were on theory of mind, 9 on attributional style (note, these were found in two studies) and 5 on emotion processing. Thus, only two out of four social cognition domains (theory of mind and emotion processing) could be studied in separate meta-analyses at present. The omission of social perception and insufficient attribution style data brings into question whether a statement can be made on global social cognition. Therefore, results on global social cognition should be interpreted cautiously.

Third, some important study moderators such as the number of MCT sessions (ranging from 8 to 16 sessions) and individual *v.* group format were not considered in the present study due to small sample size constraints. Future studies should investigate the effects of such moderators with meta-regression analyses.

Lastly, follow-up information was not included in this meta-analysis due to lack of sufficient data. It would, however, be interesting to investigate longitudinal effects in future studies as MCT has previously demonstrated 'sleeper effects' (i.e. previously unseen effects only emerging at long-term follow-up) in self-esteem and quality of life three years post-intervention (Moritz et al., 2014).

Conclusion

This meta-analysis investigated the effects of MCT on global social cognition and two of its domains: theory of mind and emotion processing. We observed that MCT has a small but significant positive effect on global social cognition and one of its domains: theory of mind. MCT has been repeatedly shown to reduce positive symptoms and cognitive biases and improve cognitive insight for individuals with SSD (Eichner & Berna, 2016; Liu et al., 2018; Lopez-Morinigo et al., 2020; Penney et al., 2022; Philipp et al., 2019; Sauvé et al., 2020). Our results support the conclusion that MCT is a valuable low-intensity intervention with multiple targets. We recommend that future studies on MCT report outcome measures on all four domains of social cognition: theory of mind, emotion processing, attributional style and social perception (as developed by Pinkham et al., 2014), use larger sample sizes and include follow-up data. It would also be of interest to investigate whether improvements in social cognition translate to improvements in real-world social outcomes for people with SSD.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/S0033291723002611

Competing interests. SM is the co-developer of MCT. His role in this study was to consult with the co-authors to ensure the inclusion of all relevant studies and accurate understanding of MCT's design. SM was not involved in any aspect of data analysis or synthesis. We also wish to disclose that the Comprehensive Research Into Schizophrenia and Psychosis (CRISP) group at the Douglas Mental Health University Institute is currently offering MCT to their clients. There are no other known conflicts of interest.

References

Barbato, M., Liu, L., Cadenhead, K. S., Cannon, T. D., Cornblatt, B. A., McGlashan, T. H., … Addington, J. (2015). Theory of mind, emotion recognition and social perception in individuals at clinical high risk for

psychosis: Findings from the NAPLS-2 cohort. *Schizophrenia Research: Cognition*, *2*(3), 133–139. doi: 10.1016/j.scog.2015.04.004

Blanchard, J. J., Park, S. G., Catalano, L. T., & Bennett, M. E. (2015). Social affiliation and negative symptoms in schizophrenia: Examining the role of behavioral skills and subjective responding. *Schizophrenia Research*, *168* (1–2), 491–497. doi: 10.1016/j.schres.2015.07.019

Bowie, C. R., Grossman, M., Gupta, M., Holshausen, K., & Best, M. W. (2017). Action-based cognitive remediation for individuals with serious mental illnesses: Effects of real-world simulations and goal setting on functional and vocational outcomes. *Psychiatry Rehabilitation Journal*, *40*(1), 53–60. doi: 10.1037/prj0000189

Bowie, C. R., & Harvey, P. D. (2006). Cognitive deficits and functional outcome in schizophrenia. *Neuropsychiatric Disease and Treatment*, *2*(4), 531–536. doi: 10.2147/nedt.2006.2.4.531

Bürkner, P.-C., Williams, D. R., Simmons, T. C., & Woolley, J. D. (2017). Intranasal oxytocin may improve high-level social cognition in schizophrenia, but not social cognition or neurocognition in general: A multilevel Bayesian meta-analysis. *Schizophrenia Bulletin*, *43*(6), 1291–1303. doi: 10.1093/schbul/sbx053

Castelein, S., Bruggeman, R., Davidson, L., & van der Gaag, M. (2015). Creating a supportive environment: Peer support groups for psychotic disorders. *Schizophrenia Bulletin*, *41*(6), 1211–1213. doi: 10.1093/schbul/sbv113

Cheung, MW–L (2019). A guide to conducting a meta-analysis with non-independent effect sizes. *Neuropsychology Review*, *29*(4), 387–396. doi: 10.1007/s11065-019-09415-6

d'Arma, A., Isernia, S., Di Tella, S., Rovaris, M., Valle, A., Baglio, F., & Marchetti, A. (2021). Social cognition training for enhancing affective and cognitive theory of mind in schizophrenia: A systematic review and a meta-analysis. *The Journal of Psychology*, *155*(1), 26–58. doi: 10.1080/00223980.2020.1818671

Davis, M. C., Green, M. F., Lee, J., Horan, W. P., Senturk, D., Clarke, A. D., & Marder, S. R. (2014). Oxytocin-augmented social cognitive skills training in schizophrenia. *Neuropsychopharmacology*, *39*(9), 2070–2077. doi: 10.1038/npp.2014.68

Eichner, C., & Berna, F. (2016). Acceptance and efficacy of metacognitive training (MCT) on positive symptoms and delusions in patients with schizophrenia: A meta-analysis taking into account important moderators. *Schizophrenia Bulletin*, *42*(4), 952–962. doi: 10.1093/ schbul/sbv225

Fekete, Z., Vass, E., Balajthy, R., Tana, Ü, Nagy, A. C., Oláh, B., … Kuritárné, I. S. (2022). Efficacy of metacognitive training on symptom severity, neurocognition and social cognition in patients with schizophrenia: A single-blind randomized controlled trial. *Scandinavian Journal of Psychology*, *63* (4), 321–333. doi: 10.1111/sjop.12811

Fett, A. K., Viechtbauer, W., Dominguez, M. D., Penn, D. L., van Os, J., & Krabbendam, L. (2011). The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis. *Neuroscience & Biobehavioral Reviews*, *35*(3), 573–588. doi: 10.1016/j.neubiorev.2010.07.001

Gard, D. E., Sanchez, A. H., Cooper, K., Fisher, M., Garrett, C., & Vinogradov, S. (2014). Do people with schizophrenia have difficulty anticipating pleasure, engaging in effortful behavior, or both? *Journal of Abnormal Psychology*, *123*(4), 771–782. doi: 10.1037/abn0000005

Gawęda, Ł, Krężołek, M., Olbryś, J., Turska, A., & Kokoszka, A. (2015). Decreasing self-reported cognitive biases and increasing clinical insight through meta-cognitive training in patients with chronic schizophrenia. *Journal of Behavior Therapy and Experimental Psychiatry*, *48*, 98–104.

Han, M., & Jun, S. S. (2020). Effects of psychotic symptoms and social cognition on job retention in patients with schizophrenia in Korea. *International Journal of Environmental Research and Public Health*, *17*(8), 1–13. doi: 10.3390/ijerph17082628

Hong, Q. N., Pluye, P., Fàbregues, S., Bartlett, G., Boardman, F., Cargo, M., … Vedel, I. (2018). Mixed methods appraisal tool (MMAT) version 2018 [pdf]. Retrieved from http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf

Hooker, C. I. (2015). Social neuroscience and psychopathology – identifying the relationship between neural function, social cognition, and social behavior. In R. Schutt, L. J. Seidman & M. Keshavan (Eds.), *Social neuroscience: Brain, mind, and society* (pp. 123–145). Massachusetts: Harvard University Press.

Horan, W. P., & Green, M. F. (2019). Treatment of social cognition in schizophrenia: Current status and future directions. *Schizophrenia Research*, *203*, 3–11. doi: 10.1016/j.schres. 2017.07.013

Horan, W. P., Subotnik, K. L., Snyder, K. S., & Nuechterlein, K. H. (2006). Do recent-onset schizophrenia patients experience a "social network crisis"?. *Psychiatry: Interpersonal and Biological Processes*, *69*(2), 115–129.

Javed, A., & Charles, A. (2018). The importance of social cognition in improving functional outcomes in schizophrenia. *Frontiers in Psychiatry*, *9*(157), 1–14. doi: 10.3389/fpsyt.2018.00157

Jelinek, L., Faissner, M., Moritz, S., & Kriston, L. (2019). Long-term efficacy of Metacognitive Training for Depression (D-MCT): A randomized controlled trial. *British Journal of Clinical Psychology*, *58*(3), 245–259.

Jelinek, L., Hauschildt, M., Wittekind, C. E., Schneider, B. C., Kriston, L., & Moritz, S. (2016). Efficacy of metacognitive training for depression: a randomized controlled trial. *Psychotherapy and Psychosomatics*, *85*(4), 231–234.

Jiang, J., Zhang, L., Zhipei, Z. H. U., Wei, L. I., & Chunbo, L. I. (2015). Metacognitive training for schizophrenia: A systematic review. *Shanghai Archives of Psychiatry*, *27*(3), 149–157. doi: 10.11919/j.issn.1002-0829.215065

Kowalski, J., Pankowski, D., Lew-Starowicz, M., & Gawęda, Ł (2017). Do specific metacognitive training modules lead to specific cognitive changes among patients diagnosed with schizophrenia? A single module effectiveness pilot study. *Psychosis*, *9*(3), 254–259.

Kukla, M., & Lysaker, P. H. (2020). Metacognition over time is related to neurocognition, social cognition, and intrapsychic foundations in psychosis. *Schizophrenia Research: Cognition*, *19*, 1–5.

Liu, Y. C., Tang, C. C., Hung, T. T., Tsai, P. C., & Lin, M. F. (2018). The efficacy of metacognitive training for delusions in patients with schizophrenia: A meta-analysis of randomized controlled trials informs evidence-based practice. *Worldviews on Evidence-Based Nursing*, *15*(2), 130–139. doi: 10.1111/wvn.12282

Lopez-Morinigo, J. D., Ajnakina, O., Martínez, A. S., Escobedo-Aedo, P. J., Ruiz-Ruano, V. G., Sánchez-Alonso, S., … David, A. S. (2020). Can metacognitive interventions improve insight in schizophrenia spectrum disorders? A systematic review and meta-analysis. *Psychological Medicine*, *50* (14), 2289–2301. doi: 10.1017/S0033291720003384

Lysaker, P. H., Cheli, S., Dimaggio, G., Buck, B., Bonfils, K. A., Huling, K., … Lysaker, J. T. (2021). Metacognition, social cognition, and mentalizing in psychosis: Are these distinct constructs when it comes to subjective experience or are we just splitting hairs? *BMC Psychiatry*, *21*(1), 1–14. doi: 10.1186/s12888-021-03338-4.

Mehta, U. M., Bhagyavathi, H. D., Kumar, C. N., Thirthalli, J., & Gangadhar, B. N. (2014). Cognitive deconstruction of parenting in schizophrenia: The role of theory of mind. *Australian & New Zealand Journal of Psychiatry*, *48*(3), 249–258. doi: 10.1177/ 00048674135 00350

Mendelson, D., Thibaudeau, É, Sauvé, G., Lavigne, K. M., Bowie, C. R., Menon, M., … Raucher-Chéné, D. (2022). Remote group therapies for cognitive health in schizophrenia-spectrum disorders: Feasible, acceptable, engaging. *Schizophrenia Research: Cognition*, *28*, 1–9. doi: 10.1016/j.scog.2021.100230.

Moran, M. (2013). Social cognition is crucial to employment in schizophrenia. *Psychiatric News*. Retrieved from https://psychnews.psychiatryonline.org/doi/full/10.1176/appi.pn.2013.5b11

Moritz, S., Veckenstedt, R., Andreou, C., Bohn, F., Hottenrott, B., Leighton, L., … Roesch-Ely, D. (2014). Sustained and "sleeper" effects of group metacognitive training for schizophrenia: A randomized clinical trial. *JAMA Psychiatry*, *71*(10), 1103–1111. doi: 10.1001/ jamapsychiatry.2014.1038

Moritz, S., Veckenstedt, R., Bohn, F., Hottenrott, B., Scheu, F., Randjbar, S., … Roesch-Ely, D. (2013). Complementary group metacognitive training (MCT) reduces delusional ideation in schizophrenia. *Schizophrenia Research*, *151*(1–3), 61–69. doi: 10.1016/j.schres. 2013.10.007

Moritz, S., & Woodward, T. S. (2007). Metacognitive training for schizophrenia patients (MCT): A pilot study on feasibility, treatment adherence, and subjective efficacy. *German Journal of Psychiatry*, *10*(3), 69–78.

Nuechterlein, K. H., Barch, D. M., Gold, J. M., Goldberg, T. E., Green, M. F., & Heaton, R. K. (2004). Identification of separable cognitive factors in

https://doi.org/10.1017/S0033291723002611 Published online by Cambridge University Press

schizophrenia. *Schizophrenia Research*, *72*(1), 29–39. doi: 10.1016/j.schres.2004.09.007

Ochoa, S., López-Carrilero, R., Barrigón, M., Pousa, E., Barajas, A., Lorente-Rovira, E., … Cid, J. (2017). Randomized control trial to assess the efficacy of metacognitive training compared with a psycho-educational group in people with a recent-onset psychosis. *Psychological Medicine*, *47*(9), 1573–1584.

Park, S., Lee, H. K., & Kim, H. (2020). Effects of a Korean version of the metacognitive training program for outpatients with schizophrenia on theory of mind, positive symptoms, and interpersonal relationships. *Behavioural and Cognitive Psychotherapy*, *48*(1), 14–24.

Penney, D., Sauvé, G., Mendelson, D., Thibaudeau, É, Moritz, S., & Lepage, M. (2022). Efficacy, maintenance effects, and moderators of metacognitive training (MCT) for psychosis: A systematic review and meta-analysis. *JAMA Psychiatry*, *79*(5), 417–429. doi: 10.1001/jamapsychiatry.2022.0277.

Philipp, R., Kriston, L., Lanio, J., Kühne, F., Härter, M., Moritz, S., & Meister, R. (2019). Effectiveness of metacognitive interventions for mental disorders in adults: A systematic review and meta-analysis (METACOG). *Clinical Psychology & Psychotherapy*, *26*(2), 227–240. doi: 10.1002/cpp.2345

Pinkham, A. E. (2014). Social cognition in schizophrenia. *Journal of Clinical Psychiatry*, *75*, 14–19. doi: 10.4088/JCP.13065su1.04

Pinkham, A. E., & Penn, D. L. (2006). Neurocognitive and social cognitive predictors of interpersonal skill in schizophrenia. *Psychiatry Research*, *143* (2–3), 167–178. doi: 10.1016/j.psychres.2005.09.005

Pinkham, A. E., Penn, D. L., Green, M. F., Buck, B., Healey, K., & Harvey, P. D. (2014). The social cognition psychometric evaluation study: Results of the expert survey and RAND panel. *Schizophrenia Bulletin*, *40*(4), 813–823. doi: 10.1093/schbul/sbt081

Sauvé, G., Lavigne, K. M., Pochiet, G., Brodeur, M. B., & Lepage, M. (2020). Efficacy of psychological interventions targeting cognitive biases in schizophrenia: A systematic review and meta-analysis. *Clinical Psychology Review*, *78*. doi: 10.1016/j.cpr.2020.101854

Schilling, L., Moritz, S., Kriston, L., Krieger, M., & Nagel, M. (2018). Efficacy of metacognitive training for patients with borderline personality disorder: Preliminary results. *Psychiatry Research*, *262*, 459–464.

Schmidt, S. J., Mueller, D. R., & Roder, V. (2011). Social cognition as a mediator variable between neurocognition and functional outcome in schizophrenia: Empirical review and new results by structural equation modeling. *Schizophrenia Bulletin*, *37*, S41–S54. doi: 10.1093/schbul/sbr079

Shan, X., Liao, R., Ou, Y., Pan, P., Ding, Y., Liu, F., … He, Y. (2021). Increased regional homogeneity modulated by metacognitive training predicts therapeutic efficacy in patients with schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience*, *271*(4), 783–798. doi: 10.1007/s00406-020-01119-w

Shany-Ur, T., & Rankin, K. P. (2014). Social cognition. In R. D. Daroff & M. J. Aminoff (Eds.), *Encyclopedia of the neurological sciences* (pp. 814–817). Massachusetts: Academic Press.

Tang, Y., Yu, L., Zhang, D., Fang, F., & Yuan, Z. (2022). The effect of social cognitive interaction training on schizophrenia: A systematic review and meta-analysis of comparison with conventional treatment. *Biomed Research International*, *2023*, 1–11. doi: 10.1155/2022/3394978.

University Medical Center Hamburg. (2021). *Metacognitive training for psychosis (MCT)*. Hamburg, Germany: University Medical Center Hamburg. Retrieved from http://www.uke.de/mct.

Ussorio, D., Giusti, L., Wittekind, C. E., Bianchini, V., Malavolta, M., Pollice, R., … Roncone, R. (2016). Metacognitive training for young subjects (MCT young version) in the early stages of psychosis: Is the duration of untreated psychosis a limiting factor? *Psychology and Psychotherapy: Theory, Research and Practice*, *89*(1), 50–65.

van Oosterhout, B., Smit, F., Krabbendam, L., Castelein, S., Staring, A., & van der Gaag, M. (2016). Metacognitive training for schizophrenia spectrum patients: A meta-analysis on outcome studies. *Psychological Medicine*, *46* (1), 47–57. doi: 10.1017/S0033291715001105

Weittenhiller, L. P., Mikhail, M. E., Mote, J., Campellone, T. R., & Kring, A. M. (2021). What gets in the way of social engagement in schizophrenia? *World Journal of Psychiatry*, *11*(1), 13–26. doi: 10.5498/wjp.v11.i1.13

Xia, J., Merinder, L. B., & Belgamwar, M. R. (2011). Psychoeducation for schizophrenia. *Cochrane Database of Systematic Reviews* (6).

Yeo, H., Yoon, S., Lee, J., Kurtz, M. M., & Choi, K. (2022). A meta-analysis of the effects of social-cognitive training in schizophrenia: The role of treatment characteristics and study quality. *British Journal of Clinical Psychology*, *61*(1), 37–57. doi: 10.1111/bjc.12320

Zonp, Z., & Bilgin, H. (2021). The effectiveness of metacognitive training on impairments in social cognition in patients with schizophrenia: Mental health nursing practice in a community mental health center. *Nordic Journal of Psychiatry*, *76*(4), 295–306. doi: 10.1080/08039488.2021.1965653

https://doi.org/10.1017/S0033291723002611 Published online by Cambridge University Press