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ORIGINAL ARTICLE

Metacognitive training for schizophrenia spectrum patients: a meta-analysis on outcome studies

B. van Oosterhout[1]*, F. Smit[2,3,4], L. Krabbendam[5], S. Castelein[6,7], A. B. P. Staring[8] and M. van der Gaag[4,9]

[1] *GGzE, De Woenselse Poort, PO Box 909, Eindhoven, The Netherlands*
[2] *Trimbos Institute (Netherlands Institute of Mental Health and Addiction), PO Box 725, Utrecht, The Netherlands*
[3] *Department of Epidemiology and Biostatistics, EMGO Institute for Health and Care Research, VU University Medical Centre, PO Box 7057, Amsterdam, The Netherlands*
[4] *Department of Clinical Psychology, EMGO Institute for Health and Care Research, VU University, PO Box 7057, Amsterdam, The Netherlands*
[5] *Department of Educational Neuroscience and Research Institute Learn!, Faculty of Psychology and Education, VU University, Van der Boechorststraat 1, Amsterdam, The Netherlands*
[6] *Lentis Psychiatric Institute, Lentis Research, PO Box 86, Groningen, The Netherlands*
[7] *University of Groningen, University Medical Center Groningen, Rob Giel Research Center, PO Box 30.001, Groningen, The Netherlands*
[8] *Altrecht Psychiatric Institute, Mimosastraat 2–4, Utrecht, The Netherlands*
[9] *Department of Psychosis Research, Parnassia Psychiatric Institute, Zoutkeetsingel 40, The Hague, The Netherlands*

Background. Metacognitive training (MCT) for schizophrenia spectrum is widely implemented. It is timely to systematically review the literature and to conduct a meta-analysis.

Method. Eligible studies were selected from several sources (databases and expert suggestions). Criteria included comparative studies with a MCT condition measuring positive symptoms and/or delusions and/or data-gathering bias. Three meta-analyses were conducted on data gathering (three studies; 219 participants), delusions (seven studies; 500 participants) and positive symptoms (nine studies; 436 participants). Hedges' *g* is reported as the effect size of interest. Statistical power was sufficient to detect small to moderate effects.

Results. All analyses yielded small non-significant effect sizes (0.26 for positive symptoms; 0.22 for delusions; 0.31 for data-gathering bias). Corrections for publication bias further reduced the effect sizes to 0.21 for positive symptoms and to 0.03 for delusions. In blinded studies, the corrected effect sizes were 0.22 for positive symptoms and 0.03 for delusions. In studies using proper intention-to-treat statistics the effect sizes were 0.10 for positive symptoms and −0.02 for delusions. The moderate to high heterogeneity in most analyses suggests that processes other than MCT alone have an impact on the results.

Conclusions. The studies so far do not support a positive effect for MCT on positive symptoms, delusions and data gathering. The methodology of most studies was poor and sensitivity analyses to control for methodological flaws reduced the effect sizes considerably. More rigorous research would be helpful in order to create enough statistical power to detect small effect sizes and to reduce heterogeneity. Limitations and strengths are discussed.

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Key words: Cognitive biases, metacognitive training, psychosis, schizophrenia.

Introduction

Recent developments in cognitive–behavioural therapy (CBT) in psychosis

CBT is recommended for psychosis in many national guidelines (e.g. National Institute of Clinical Excellence, 2009). Meta-analyses have demonstrated modest but robust positive effects in blinded CBT trials on psychotic symptoms with small to moderate effect sizes: effect size positive symptoms = 0.29 (Zimmermann *et al.* 2005); effect size positive symptoms = 0.23 (Wykes *et al.* 2008); effect size positive symptoms = 0.43 (Burns *et al.* 2014); effect size delusions = 0.24 and hallucinations = 0.46 (van der Gaag *et al.* 2014). One meta-analysis produced a non-significant effect size in blinded studies: effect size positive symptoms = 0.08 (Jauhar *et al.* 2014). Moreover, CBT was superior to any other psychosocial intervention in reducing positive symptoms (Turner *et al.* 2014) and yielded robust results in all sensitivity analyses for risk of bias. It only disappeared in allegiance sensitivity analysis because of lack of power, as only three studies were non-alleged. The focus

* Address for correspondence: B. van Oosterhout, GGzE, PO Box 909, 5600 AX, Eindhoven, The Netherlands.
(Email: bj.van.oosterhout@dewoenselsepoort.nl)

recently moved to examination of the working mechanisms and cognitive biases. The biases associated with data gathering and the appraisal and processing of information are associated with psychosis in general and, in particular, to positive symptoms such as (persecutory) delusions (van der Gaag, 2006; Freeman, 2007). The focus of therapies and training has moved from a predominantly content-oriented focus (what is the patient thinking?) towards a process-oriented focus on cognitive biases (Garety *et al.* 2001; Morrison, 2001; Bentall *et al.* 2009; Bennett & Corcoran, 2010).

Cognitive biases associated with delusions

Several cognitive biases, such as jumping to conclusions (JTC), belief inflexibility, problems in theory of mind and externalizing attributions, are hypothesized to be associated with the pathogenesis and maintenance of delusions. The JTC bias refers to a tendency to gather less data or evidence than healthy controls in order to reach a decision or accept a hypothesis (Garety *et al.* 1991; Fine *et al.* 2007). The JTC bias has also been found in individuals at risk for psychosis (Colbert & Peters, 2002; Van Dael *et al.* 2006) and in highly deluded and remitted patients (Moritz & Woodward, 2005). Belief inflexibility refers to a bias against disconfirmatory evidence (Woodward *et al.* 2008) and is particularly related to delusional preoccupation and conviction (Garety *et al.* 2005; Colbert *et al.* 2010). Furthermore, problems in theory of mind (i.e. the inability to represent the beliefs, thoughts and intentions of others), which is known to be related to symptoms of disorganization, may also contribute to paranoid delusions (Craig *et al.* 2004; Versmissen *et al.* 2008; Abdel-Hamid *et al.* 2009); however, there is mixed evidence on this topic, with some studies finding no associations (Fernyhough *et al.* 2008) or an intact theory of mind during a delusional state (Walston *et al.* 2000). Finally, there is evidence that an externalizing attribution style, with patients making external (personal) attributions for negative events and internal attributions for positive events, is associated with delusions (Kaney & Bentall, 1989; Kinderman & Bentall, 1997; Janssen *et al.* 2006). Again, inconsistent findings have been reported, with some studies finding no differences between early psychosis patients and controls in the tendency to externalize or personalize (Langdon *et al.* 2013) and others concluding that the link between persecutory ideation and attribution biases only manifests when persecutory ideation is of delusional intensity, and that it is confined to only a personalizing bias (McKay *et al.* 2007). Generally speaking, the above-mentioned cognitive biases are of interest since they are assumed to mediate (or moderate) treatment response in delusional symptoms (So *et al.* 2010).

Metacognitive training in schizophrenia

Moritz & Woodward (2007) were the first to translate theoretical results on cognitive biases and processes into a series of training modules called metacognitive training (MCT). Furthermore, sessions on overconfidence in memory errors and depressive cognitive patterns were added. MCT aims to increase the patient's knowledge about cognitive biases and to raise (metacognitive) awareness of the dysfunctional nature of these biases by means of exercises. It adopts a 'back-door approach' by first addressing cognitive biases instead of directly aiming at core delusional beliefs. MCT is group-wise training for 3–10 patients and is comprised of eight different modules targeting cognitive biases. Exercises that demonstrate the fallibility of human cognitive apparatus are discussed in the group. Participants are encouraged to express personal examples of these biases, and discussion of ways to counter them, serving to provide corrective experiences in a supportive atmosphere. This approach has obvious advantages over mere didactic providing of information. Patients are taught to recognize and confront the biases that are important in schizophrenia, thus allowing them to arrive at more appropriate inferences.

The published results on MCT are inconsistent and the evidence for efficacy is still undecided. At the same time there is a widespread dissemination and the MCT modules are available in 33 languages and are used all over the globe. Although the number of studies is relatively small for properly powered meta-analysis ($n = 11$), we considered that it was necessary to systematically review the current literature and to conduct a meta-analysis on the effects of MCT compared with treatment-as usual or active controls on data-gathering bias, delusions and positive symptoms of psychosis in patients with positive symptoms of schizophrenia.

Method

Data collection

Eligibility criteria

Studies had to meet the following criteria for inclusion: (*a*) the experimental treatment was MCT (Moritz/Woodward approach); (*b*) the study had to be a comparative trial with or without randomization; (*c*) reporting both pre- and post-test measures; (*d*) any control condition was accepted; (*e*) at least 75% of the patients were diagnosed with schizophrenia spectrum

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disorders; (*f*) only published in peer-reviewed journals (conference abstracts were excluded); and (*g*) the study used data gathering, delusion ratings and/or positive symptom ratings as an outcome measure. Although there were no language restrictions, all studies were in the English language. The PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) guidelines for systematic reviews and meta-analyses were followed (Liberati *et al.* 2009).

Information sources

Studies were selected by various methods. First, a systematic search was made (from 2002 to 1 July 2014) in Medline, PsycINFO, EMBASE, the Cochrane Central Register of Controlled Trials and the Cochrane Database of Systematic Reviews, to detect studies describing metacognitive therapy or training in patients with positive symptoms of psychosis and schizophrenia.

Articles were identified by combining terms indicative of metacognitive psychological treatment (search terms included 'metacognitive training' OR 'MCT') AND outcome research (search terms included 'randomised controlled trial', 'randomized controlled trial' OR 'RCT) (for the algorithm, please contact the first author; B.v.O.).

Second, the search was supplemented by relevant papers identified by manual search of the reference lists of the identified articles. Finally, leading researchers in the field of CBT and MCT (Professor S. Moritz, Professor P. Garety, Professor D. Freeman and Professor A. Morrison) were asked to make suggestions regarding relevant literature.

Data extraction

The titles of the 611 retrieved papers were screened for eligibility by the first author (B.v.O.). A first selection on the topic of 'MCT in psychosis' resulted in 22 potential papers.

A few studies were excluded based on the aforementioned criteria: Aghotor *et al.* (2010) (based on criterion *c*); Erawati *et al.* (2014) (based on criterion *c*); Favrod *et al.* (2011) (based on criterion *b*); Ferwerda *et al.* (2010) (based on criteria *b*); Moritz & Woodward (2007) (based on criterion *g*); Moritz *et al.* (2011*a*) (based on criterion *g*: no reports on total scores, only subscales).

Finally, 11 studies were included in this meta-analysis (Fig. 1). One study had delusional symptoms as the primary outcome (van Oosterhout *et al.* 2014), two had positive symptoms as the primary outcome (Naughton *et al.* 2012; Balzan *et al.* 2014) and five papers dealt with both delusional symptoms and positive symptoms (Kumar *et al.* 2010; Moritz *et al.* 2011*b*; Briki *et al.* 2014; Favrod *et al.* 2014; Kuokkanen *et al.* 2014). One paper dealt with both data-gathering bias and positive symptoms (Rocha & Queiros, 2013), one paper dealt with data-gathering bias, positive symptoms and delusional symptoms (Moritz *et al.* 2013), and one paper had data-gathering bias as the primary outcome (Ross *et al.* 2011).

Table 1 lists the characteristics of the 11 selected studies. Studies differed in sample size from 16 (Kumar *et al.* 2010) to 150 (Moritz *et al.* 2013). Four trials had in-patients, four had out-patients and three had both. Training was either eight or 16 sessions in most trials, but only short modules of only a maximum 60 min in two trials. Several researchers had made small adaptations to the MCT package. The trial by Moritz *et al.* (2011*b*) embedded the MCT within an individual CBT; Rocha & Queirós (2013) added training in social cognition; Balzan *et al.* (2014) had a single module focusing on data gathering and bias against disconfirmation, and Ross *et al.* (2011) had a cut-down single module version partially (2/3) based on MCT. So, there was quite some heterogeneity in the training format.

Quality assessment

The methodological quality of the eligible studies was reviewed using the Clinical Trial Assessment Measure (CTAM; Tarrier & Wykes, 2004). Quality ratings were based on the following criteria: sample characteristics (i.e. is the sample a convenience sample or a geographically representative cohort?; sample size); allocation procedures (i.e. valid randomization procedure); assessment of outcomes (i.e. standardized assessment method used); control condition (i.e. has a credible control condition been implemented?); analysis (i.e. appropriate statistical analysis given the design and type of outcome); description of treatment (i.e. has the treatment been sufficiently described or manualized?).

The maximum achievable score on the CTAM is 100. Similar to Wykes *et al.* (2008) we adopted an arbitrary cut-off score of 65 to denote either high- or low-quality studies. Two experienced independent raters (S.C. and A.B.P.S.) performed the screenings. A consensus meeting was held to resolve differences in scores and ratings.

Data analysis

Meta-analyses were conducted for the end-of-treatment effects for each of the available outcome measures separately. The outcomes at the end of treatment across the trials were synthesized meta-analytically using Comprehensive Meta-Analysis version 2.2 (www.meta-analysis.com). *Post-hoc* power analysis for random-effects models in meta-analysis

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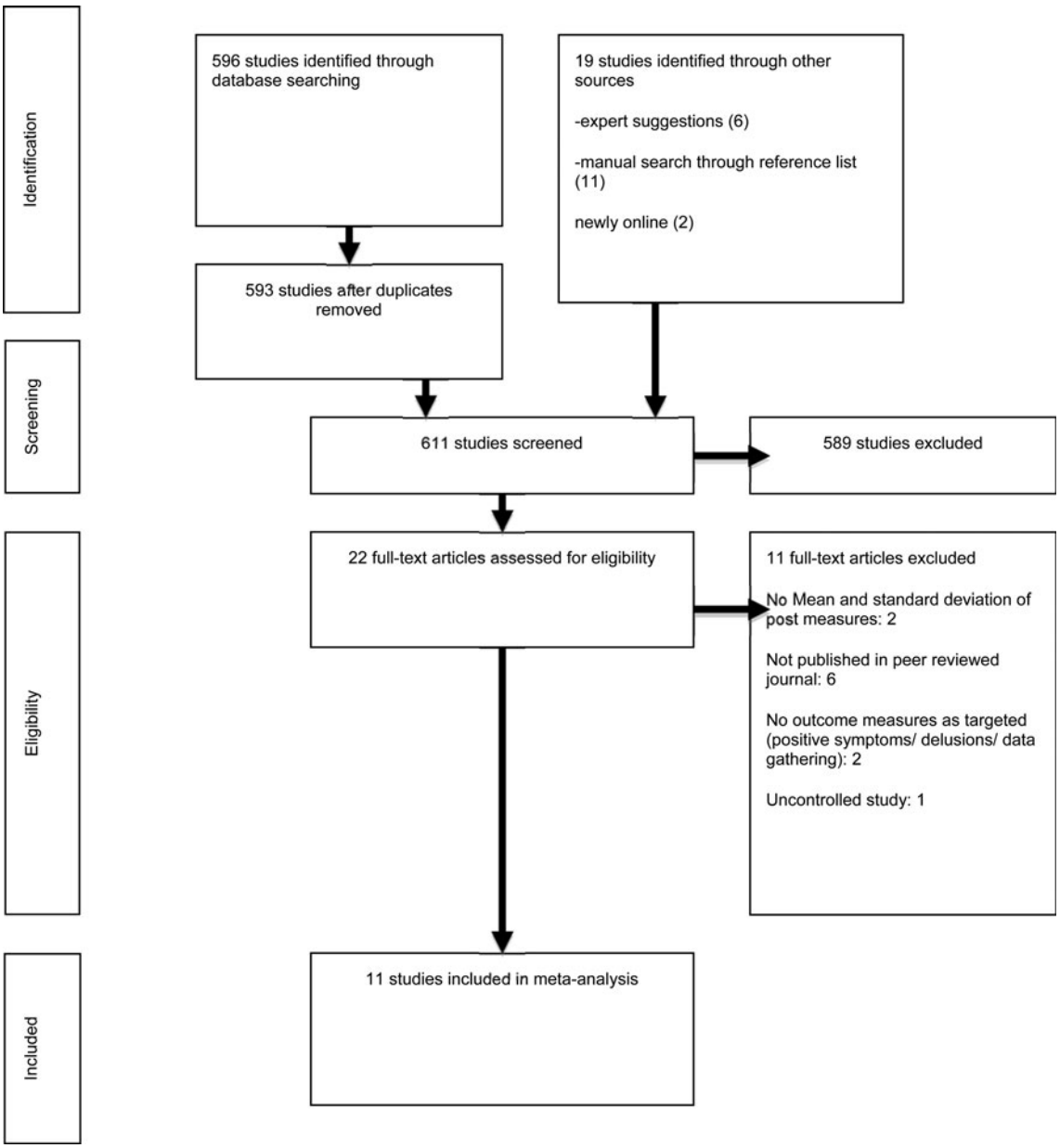

Fig. 1. Flowchart.

resulted in a detectable small to moderate pooled effect size of 0.37 (Hedges' g; two-sided, power = 0.80, $\alpha = 0.05$) in both positive symptoms and delusions.

The studies in this meta-analysis examined different samples and used various control interventions. Therefore, differences between the effect sizes are likely to reflect these sources of heterogeneity. A random-effects model for meta-analytic synthesis of effect sizes across the primary studies was conducted. Most studies used small samples. We decided to use Hedges' g as the effect size, which is corrected for small sample bias.

Heterogeneity is always a matter of concern in meta-analysis. Therefore, we evaluated whether the variability in the outcomes across the studies could be attributed to random sample error alone, or might be attributed to systematic factors, such as type of intervention. We tested heterogeneity with a χ^2 test and degrees of freedom (df) set at the number of primary studies in the meta-analysis minus one. We also report the I^2 statistic, which is easier to interpret: when $I^2 = 0$, 25, 50 or 75%, then no, low, moderate or high heterogeneity, respectively, is assumed (Higgins *et al.* 2003).

Meta-analysis may be subject to publication bias. When publication bias was likely, then Duval and Tweedie's trim-and-fill procedure was used; this yields an adjusted estimate of the pooled effect size after publication bias has been taken into account (Duval & Tweedie, 2000).

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Table 1. *Description of the interventions, patient characteristics, quality of the studies and location*

				Experimental condition						Control condition							
Author	Year	Setting	Severity of symptoms delusions	Intervention	Number of sessions	*n*	Drop-out, %	Mean age, years (S.D.)	Male sex, %	Intervention	Number of sessions	*n*	Drop-out, %	Mean age, years (S.D.)	Male sex, %	CTAM quality	Country
Kumar *et al.*	2010	In-patients	Acute symptoms	MCT	8 sessions	8	0	31 (8.0)	N.A.	TAU	N.A.	8	0	34 (8.2)	N.A.	38	India
Moritz *et al.*[a]	2011*b*	In-patients	Subacute symptoms	MCT + CBT	8 sessions MCT + 9 sessions CBT	24	4	33 (12.5)	71	CogPack	8	24	12.5	35 (9.1)	58	65	Germany
Naughton *et al.*	2012	(Forensic) in-patients	Mild-to-moderate	MCT	16 sessions	11	0	37 (10.6)	100	TAU	N.A.	8	0	36 (11.2)	100	20	Ireland
Moritz *et al.*	2013	In-patients and out-patients	Mild to moderate[b]	MCT	8 or 16 sessions	76	12	37 (11.1)	59	CogPack	Maximum 16 sessions	74	16	33 (9.5)	66	80	Germany
Rocha & Queirós	2013	Out-patients	Clinically stable	MSCT	18 sessions	19	0	39 (8.9)	84	TAU	N.A.	16	0	36 (8.7)	94	25	Portugal
Ross *et al.*	2011	Out-patients	Moderate to severe	MCT-JTC	45 min	17	0	39 (10.2)	74	TAU	N.A.	17	0	36 (12.2)	71	60	England
Balzan *et al.*	2014	Out-patients	Mild to moderate	MCT-T	1 h	14	0	38 (8.1)	78	TAU	N.A	14	0	35 (8.7)	64	25	Australia
Favrod *et al.*	2014	Out-patients	Mild to moderate	MCT	8 × MCT	26	8	37 (9.8)	65	TAU	N.A.	26	12	37 (10.4)	65	61	Switzerland
van Oosterhout *et al.*	2014	In-patients and out-patients	Moderate to severe	MCT	8 × MCT	75	31	38 (11.1)	68	TAU	N.A.	79	24	37 (8.7)	71	76	Netherlands
Kuokkanen *et al.*	2014	(Forensic) in-patients	Minimal to mild	MCT	8 × MCT	10	20	N.A.	N.A.	TAU	N.A.	10	0	N.A.	N.A.	31	Finland
Briki *et al.*	2014	In-patients and out-patients	Mild to severe	MCT	16 × MCT	35	17/11[c]	41 (8.1)	64	SC	16	33	24	41 (12.4)	68	62	France

S.D., Standard deviation; CTAM, Clinical Trial Assessment Measure; MCT, meta-cognitive training; N.A., not applicable; TAU, treatment as usual; CBT, cognitive–behavioural therapy; MSCT, MCT plus social cognition training; MCT-JTC, 45-min single session partially based on MCT; MCT-T, 60-min single session focusing on data-gathering bias and confirmation bias modules; SC, supportive counselling.

[a] Selected outcome was the algorithm of van der Gaag (van der Gaag *et al.* 2006).

[b] Patients with scores of 6 or 7 on the Positive and Negative Syndrome Scale paranoia/suspiciousness subscale were excluded.

[c] Removed from analysis due to attending fewer than eight sessions.

Sensitivity analyses

The inclusion of studies was relatively liberal. High- and low-quality studies with various types of statistical analyses and procedures to correct for unblinding were selected. To examine the effects of study quality, we conducted additional sensitivity analyses in which we successively included high-quality, low-quality and blinded studies, as well as studies using proper intention-to-treat analysis. In order to correct for allegiance bias we used the criteria of the Researcher Allegiance Assessment Tool (Cuijpers *et al.* 2012) which accounts for the following criteria: (1) only one of the interventions was mentioned in the title; (2) one of the two interventions was explicitly mentioned as the main experimental intervention in the introduction section of the study; (3) one intervention was explicitly described as a control condition included to control for the non-specific components of the other therapy; and (4) there was an explicit hypothesis that one comparison therapy was expected to be more effective than the other. When these criteria were applied none of the studies was non-alleged. Therefore we could not run analyses on allegiance bias.

Results

Characteristics of the included studies

Table 2 presents the results of the primary studies measuring positive symptoms analysis (upper part), delusions analysis (middle part) and data-gathering bias (lower part).

Overall analysis on primary outcome measures

Positive symptoms

Overall analysis of the effects of MCT on positive symptoms. The results on the positive symptoms are presented in Table 2 (upper panel) and Fig. 2. The effect size (g = 0.26) showed a statistical tendency. But correction for publication bias reduced the effect size to non-significant (g = 0.21). Heterogeneity was moderate. Both the high- and low-quality studies were non-significant. Four blinded studies had significant results (g = 0.36), but correction for publication bias reduced the effect size again to non-significant (g = 0.22). If proper intention-to-treat statistics were used (in one study only) the effect size was very small and non-significant (g = 0.10). For funnel plots, see Supplementary Figs S1 and S2.

Delusions

Overall analysis of the effects of MCT on delusions. The results on the delusions are presented in the middle panel of Table 2 and Fig. 3 and showed a non-significant effect size (g = 0.22), which was further reduced after correction for publication bias (g = 0.03). The level of heterogeneity was moderate. High-quality studies (g = 0.11), blinded studies (g = 0.17) and studies with intention-to-treat statistics (g = −0.02) were all non-significant. Just the low-quality studies showed a significant effect. One-by-one removing of a single trial resulted in significance for the effect of MCT on delusions. This was the case if the van Oosterhout *et al.* (2014) trial was removed: a trial with zero findings and high CTAM score compared with the other trials. For funnel plots, see Supplementary Figs S3, S4, S5 and S6.

Data-gathering bias

Overall analysis of the effects of MCT on delusions. The results on the data-gathering bias are presented in the lower panel of Table 2 and Fig. 4; results showed a non-significant effect (g = 0.31). The level of heterogeneity was moderate.

Conclusions

Main findings

Currently, the evidence of this meta-analysis does not support the efficacy of MCT for any of the outcomes selected. All main analyses on positive symptoms, delusions and data-gathering bias yielded non-significant effect sizes. Corrections for publication biases using the trim-and-fill procedure further reduced the effect sizes. In general, the effect sizes were further reduced in high-quality studies, blinded studies and studies using proper intention-to-treat analysis. The exception was the results of the blinded studies measuring positive symptoms, with results resembling the effects of CBT. Nevertheless, significance disappeared after correction for publication bias.

In almost all analyses there was a moderate to high level of heterogeneity, which makes it difficult to interpret the findings and increases the risk of bias. This raises the question to what extent other (methodological and clinical) trial characteristics may contribute to the effects in the various trials and whether positive or negative effects were exerted on the true effect sizes. Differences in types of patients, levels of delusional symptomatology at baseline, treatment dosage and lack of randomization and blindness are probably causing the heterogeneity in the results of the studies.

In our trial we found no effect on data gathering or on delusions and a non-specific effect on positive symptoms in high-quality studies (which disappeared after correction for publication bias). Regarding the

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Table 2. *Random effect sizes, heterogeneity and publication bias in the main and sensitivity analyses*

	Random effect sizes				Heterogeneity			Publication bias	
Analysis	Number of contrasts	Hedges' *g* (95% CI)	*Z*	*p* value of *Z*	*Q* (df)	*p* value of *Q*	I^2	Funnel plot	Trim-and-fill-corrected Hedges's *g*
Effects on positive symptoms									
Main with all studies	9	0.256 (−0.01 to –0.52)	1.927	0.054	12.507 (8)	0.130	36.0/MOD	1 missing	0.207
High-quality studies, CTAM > 65	2	0.279 (−0.18 to 0.74)	1.196	0.232	2.101 (1)	0.147	52.4/MOD	N.A.	N.A.
Low-quality studies, CTAM < 65	7	0.224 (−0.12 to 0.60)	1.334	0.182	10.367 (6)	0.110	42.1/MOD	0 missing	No correction
Blinded	4	0.359 (0.09 to 0.63)	2.570	0.010	3.921 (3)	0.270	23.5/LOW	2 missing	0.223
Intention-to-treat analysis	1	0.098 (−0.22 to 0.42)	0.604	0.546	N.A.	N.A.	N.A.	N.A.	N.A.
Effects on delusions									
Main with all studies	7	0.223 (−0.05 to 0.49)	1.630	0.103	11.306 (6)	0.079	46.9/MOD	3 missing	0.034
High-quality studies, CTAM > 65	3	0.108 (−0.30 to 0.52)	0.518	0.604	6.863 (2)	0.032	70.9/HIGH	2 missing	−0.253
Low-quality studies, CTAM < 65	4	0.387 (0.05 to 0.72)	2.257	0.024	1.643 (3)	0.650	0/NO	1 missing	0.326
Blinded	5	0.174 (−0.12 to 0.47)	1.151	0.250	9.089 (4)	0.059	56.0/HIGH	2 missing	0.028
Intention-to-treat analysis	2	−0.017 (−0.48 to 0.45)	−0.071	0.944	4.276 (1)	0.039	76.6/HIGH	N.A.	N.A.
Effects on data-gathering bias									
Main analysis (15–85 and 20–80)	3	0.307 (−0.16 to 0.77)	1.289	0.198	4.586 (2)	0.101	56.4/MOD	N.A.	N.A.

CI, Confidence interval; *Q*, value for heterogeneity tested by χ^2; df, degrees of freedom; I^2, degree of heterogeneity; MOD, moderate heterogeneity; CTAM, Clinical Trial Assessment Measure; N.A., not applicable; LOW, low heterogeneity; HIGH, high heterogeneity; NO, no heterogeneity.

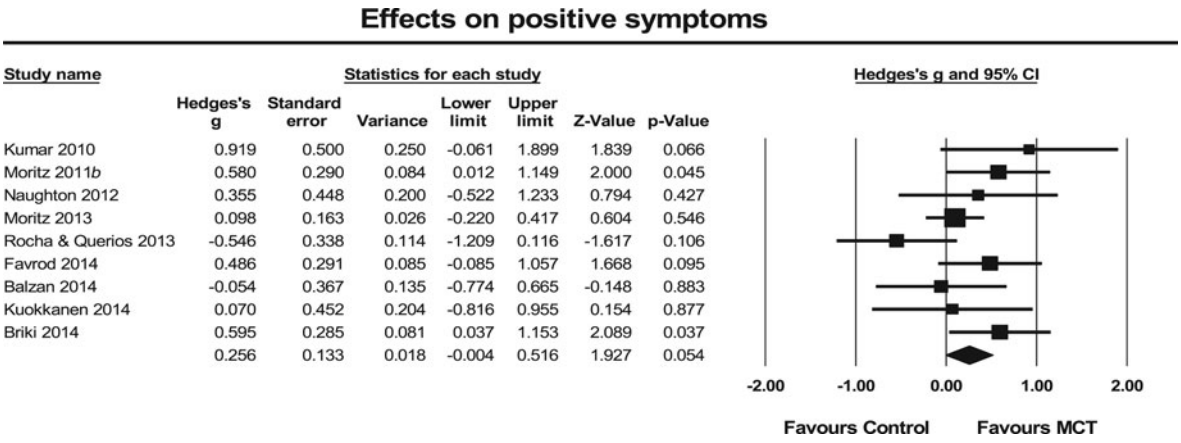

Fig. 2. Forest plot of the effect on positive symptoms of psychosis. CI, Confidence interval; MCT, meta-cognitive training.

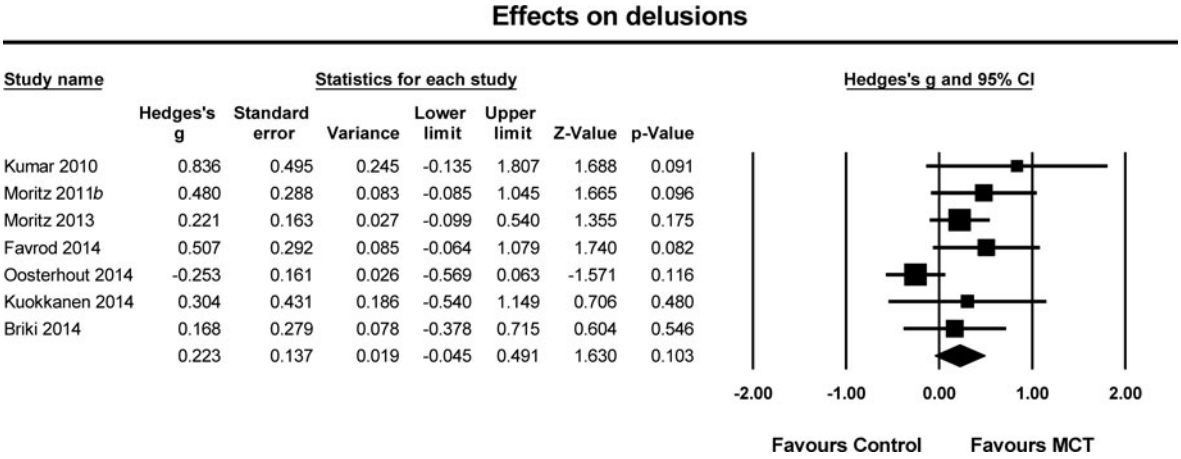

Fig. 3. Forest plot on the effect on delusions. CI, Confidence interval; MCT, meta-cognitive training.

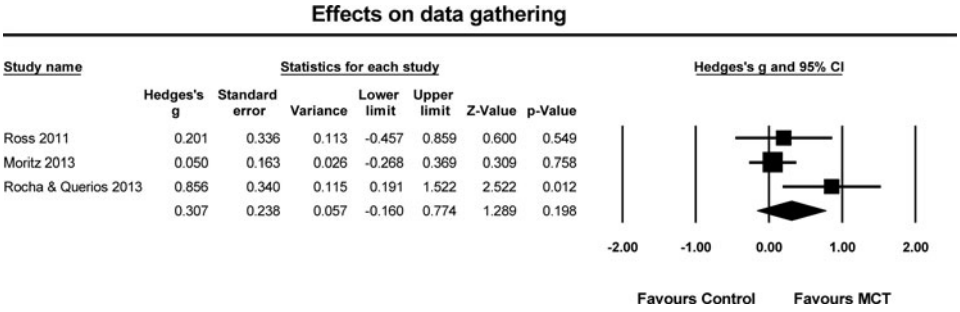

Fig. 4. Forest plot on data-gathering bias. CI, Confidence interval; MCT, meta-cognitive training.

data-gathering bias, only the Rocha trial (Rocha & Queiros, 2013) found a significant effect, but also showed a worsening of positive symptoms instead of a reduction. The largest trial, from Moritz *et al.* (2013), found no effect on data gathering and only small non-significant effects on positive symptoms. Freeman *et al.* (2014) reported that only 24% of delusional patients showed a data-gathering bias and that this was associated with deficits in working memory, lower intelligence quotient, lower levels of tolerance for uncertainty, and lower worry. The data gathering-bias was not associated with psychopathology in that study. Thus, data gathering might better be addressed by retraining working memory rather

than by education. Also, the association between data-gathering bias and delusions is not very robust, as some studies found no such associations (Young & Bentall, 1997; McKay *et al.* 2007). This raises the question as to what extent data gathering (JTC) and delusions are causally linked, or whether JTC is an epiphenomenon related to psychosis and if making patients aware of cognitive biases and its negative consequences (aim of MCT/back-door approach) is necessary to achieve symptom reduction.

One of the most successful studies was conducted by Moritz *et al.* (2011*b*). This was in fact MCT plus CBT (mentioned as 'MCT+'). The positive effect might be due to the effective CBT part of the intervention, rather than to the MCT part. The individual study was marginally significant on positive symptoms and showed a tendency on delusions. However, as this was not compared with CBT alone, the addition of MCT to the effective CBT cannot be evaluated at this moment. Furthermore, it was observed that the developers of MCT have found positive results, but so far independent testing by other research groups has not indicated significant change in positive symptoms (with the exception of a small study; Briki *et al.* 2014) or in delusions (with the exception of a small study; Favrod *et al.* 2014). Moreover, in our study we found the latter studies to have relatively low CTAM scores, reflecting lower methodological quality. More recent findings on MCT (Moritz *et al.* 2014) reported consolidation of delusion scores and consolidation of no effect on JTC. In the completer analysis with 40% drop-out the Positive and Negative Syndrome Scale positive symptoms deteriorates in the control, probably due to an increase in hallucinations. The intention-to-treat analysis reported a group effect over all time moments and no group x follow-up interaction. We think these results are hard to interpret. Independent research indicating positive change is necessary for any treatment to be added to evidence-based guidelines for routine care.

Strengths and limitations

The present study has several strengths and limitations. A strength is that separate meta-analyses were conducted on different outcome measures such as data-gathering bias, delusions and positive symptoms.

Another strength was the statistical power to detect small to medium effect sizes. There is little chance of making a type 2 error and incorrectly reject the hypothesis that MCT is efficacious.

At the same time the power is a limitation. Nevertheless, a cumulative analysis on the positive symptom and delusion outcomes showed that the effects stabilized at small and non-significant effect sizes after five trials.

General conclusions

This is the first meta-analysis on MCT. Currently, we can state that the studies do not support a positive effect for MCT on positive symptoms, data gathering and delusions. The methodology of most studies was poor and sensitivity analyses with blinded studies, high-quality studies, and studies that used intention-to-treat analyses reduced the effect sizes even further. Also correction for publication bias reduced the effect sizes considerably. Dissemination of MCT in routine care cannot be recommended at this moment. More rigorous research would be helpful in order to create enough statistical power to detect small effect sizes and to reduce heterogeneity.

Supplementary material

For supplementary material accompanying this paper visit http://dx.doi.org/10.1017/S0033291715001105

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Declaration of Interest

None.

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