



Sowing *the seeds of doubt*: a narrative review on metacognitive training in schizophrenia



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HIGHLIGHTS

- Recovery under antipsychotics is incomplete.
- Dissemination of psychotherapy in psychosis is still poor.
- Metacognitive training (MCT) is available for free in 31 languages.
- MCT, particularly its individualized version, improves positive symptoms.

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ABSTRACT

The present article provides a narrative review of empirical studies on metacognitive training in psychosis (MCT). MCT represents an amalgam of cognitive-behavioral therapy (CBT), cognitive remediation (CRT) and psychoeducation. The intervention is available in either a group (MCT) or an individualized (MCT+) format. By sowing the *seeds of doubt* in a playful and entertaining fashion, the program targets positive symptoms, particularly delusions. It aims to raise patients' awareness for common cognitive *traps* or biases (e.g., jumping to conclusions, overconfidence in errors, bias against disconfirmatory evidence) that are implicated in the formation and maintenance of psychosis. The majority of studies confirm that MCT meets its core aim, the reduction of delusions. Problems (e.g., potential allegiance effects) and knowledge gaps (i.e., outcome predictors) are highlighted. The preliminary data suggest that the individual MCT format is especially effective in addressing symptoms, cognitive biases and insight. We conclude that MCT appears to be a worthwhile complement to pharmacotherapy.

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Doubt is not a pleasant condition, but certainty is absurd.
Voltaire (French humanist 1694–1778)

1. Introduction

Delusions, commonly defined as fixed false beliefs that are held with high conviction, are a hallmark feature of schizophrenia. Yet, delusions are not pathognomonic of schizophrenia (Carpenter, Strauss, & Muleh, 1973) and, in fact, represent a common transdiagnostic symptom.

Conventionally, delusional beliefs are treated with antipsychotic agents that act through a blockade of dopaminergic (mainly D2-receptor mediated) neurotransmission. While the exact cognitive pathways through which antipsychotics exert their effects have not been fully unraveled, recent data suggest that antipsychotics promote doubt (Andreou, Moritz, Veith, Veckenstedt, & Naber, 2014; Moritz, Andreou, Klingberg, Thoering, & Peters, 2013; Moritz, Woodward, Jelinek, & Klinge, 2008; Moritz, Woodward, & Ruff, 2003) and lead to emotional detachment (Mizrahi et al., 2006). Despite their partial efficacy, discontinuation rates of antipsychotic medication are typically quite high due to several factors such as lack of insight and adverse effects (Byerly, Nakonezny, & Lescouffair, 2007; Lambert et al., 2010; Lieberman et al., 2005). Even when antipsychotics are taken as prescribed, their effects on positive symptoms achieve only a moderate effect size (Leucht, Arbter, Engel, Kissling, & Davis, 2009), and complete recovery is rare (Jaaskelainen et al., 2013).

Cognitive therapy for psychosis has attracted increasing attention in recent years, based on two important trends. First, the initial enthusiasm for pharmacological monotherapy has been tempered by findings signaling only partial efficacy of antipsychotic medication, coupled with mounting (but yet inconclusive) evidence of possible neurodegenerative effects of antipsychotic medications (Ho, Andreasen, Ziebell, Pierson, & Magnotta, 2011; Moncrieff, 2011). Second, and perhaps more importantly, cognitive researchers have begun to piece together the basis of a psychological theory of psychosis, which has led to a number of fruitful heuristic models (Bentall et al., 2009; Freeman, 2007; van der Gaag, 2006).

Psychological therapies use different approaches in treating delusional beliefs and other symptoms of psychosis. Cognitive-behavioral therapy (CBT) has gained the largest empirical support (Wykes, Steel, Everitt, & Tarrier, 2008), despite recent criticism (Jauhar et al., 2014). There is also evidence that cognitive remediation (CRT) ameliorates cognitive dysfunction in schizophrenia (Wykes, Huddy, Cellard, McGurk, & Czobor, 2011). Notwithstanding these improvements, the treatment gap (i.e., absolute difference between the true prevalence of a disorder and the treated proportion of individuals affected by the disorder) for schizophrenia is estimated at 69% in most part of the world; that is, only a minority of individuals with psychosis receive pharmacological and/or psychological treatment (Lora et al., 2012). To bridge this gap and “treat the untreated” low threshold programs are needed.

The remainder of this review will deal with metacognitive training for psychosis (MCT) (Moritz, Veckenstedt, Bohn, Köther, & Woodward, 2013; Moritz, Vitzthum, Randjbar, Veckenstedt, & Woodward, 2010; Moritz, Woodward, & Burlon, 2003, 2005). The intervention is available either as a group (i.e., MCT) or an individualized (i.e., MCT+) format. The manualized group training program (Moritz, Veckenstedt, Bohn, Köther, et al., 2013; Moritz et al., 2010) is currently available at no cost in 31 languages (free download at <http://www.uke.de/mct>). MCT builds upon a large body of literature indicating that the core

features of delusions (such as overconfidence, incorrigibility and hasty decision-making) are not confined to delusional beliefs, but rather represent more general biased styles of thinking that can be observed in patients even in delusion-neutral situations. Importantly, although these cognitive biases are implicated in psychosis, they are viewed by cognitive psychology simply as an extension of normal thinking styles, which can be addressed using standard psychological approaches. Thus, delusions are perhaps only the visible “tip of the iceberg.”

MCT can be considered an amalgam of CRT, CBT and psycho-education. Like CRT, patients are presented with multiple cognitive tasks (e.g., remembering details in a picture, deducing titles from paintings), whereby the focus lies on attenuating overconfidence in errors rather than accuracy. Like CBT for psychosis (CBTp), MCT shares the goal of targeting psychotic symptoms, but adopts a “back door approach” by dealing with cognitive processes first and then proceeding to the symptom level (particularly the individualized variant MCT+, see below). This more gentle approach is considered advantageous for patients who cannot distance themselves from their delusions or whose positive symptoms actually foster their self-esteem (Moritz, Werner, & von Collani, 2006; Sundag, 2012) and are considered by patients to be valuable (and partly positive) experiences (Klapheck, Nordmeyer, Cronjager, Naber, & Bock, 2012). In accordance with this, recent evidence shows that guided discovery, an effective core technique of CBT, that uncovers incongruities or inconsistencies in patients’ conclusions, may reduce the therapeutic alliance (Wittorf et al., 2013). Table 1 summarizes the content and learning aims of the eight MCT group modules.

MCT+ is the individualized format of MCT, which is available for free in seven languages via www.uke.de/mct_plus. Over and above the domains addressed in MCT, it targets negative symptoms and allows for in-depth assessment and treatment of individual symptoms through the generation of an illness model and a recovery plan.

1.1. Metacognitive training in schizophrenia (MCT)

The training (2 sets of 8 modules each for most language versions) capitalizes on the finding that patients display increased cognitive biases, which according to recent reviews, are putatively involved in the formation and maintenance of psychosis (e.g., Garety & Freeman, 2013; Moritz, Andreou, et al., 2013; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013; Moritz, Veckenstedt, Bohn, Köther, et al., 2013). Importantly, patients are often unaware of these biases as well as cognitive impairments (Freeman, 2007; Moritz, Ferahli, & Naber, 2004). Heuristic models like the one proposed by Freeman (2007) ascribe both emotional and cognitive factors an important role in the pathogenesis of psychoses. Affective states, particularly depression and anxiety, are regarded as necessary but not sufficient preconditions. If these coincide with anomalous experiences and/or reasoning biases, a psychotic episode may occur.

Beta versions of the training date back to 2002; the modules address all cognitive biases highlighted in a review by Garety and Freeman in 1999: jumping to conclusions (Garety & Freeman, 2013; Garety, Hemsley, & Wessely, 1991; Lincoln, Ziegler, Mehl, & Rief, 2010), impairments in social cognition/theory of mind (Brüne, 2005; Roder & Medalia, 2010; Savla, Vella, Armstrong, Penn, & Twamley, 2013), attributional distortions (Bentall, Corcoran, Howard, Blackwood, & Kinderman, 2001; Kinderman & Bentall, 1997; Randjbar, Veckenstedt, Vitzthum, Hottenrott, & Moritz, 2011) and affective biases (Freeman et al., 1998; Moritz et al., 2006). Moreover, the training incorporates

Table 1
Content and learning aims of the eight MCT group modules.

MCT module	Exercises (examples)	Learning aim
1. Attribution [Mono-causal inferences]	Different causes (self, others, circumstances) for complex positive and negative events must be contemplated (e.g., you fail an exam).	Patients are taught to consider various causes instead of converging on mono-causal explanations. The negative consequences of a self-serving attribution are highlighted.
2. Jumping to conclusions I	Fragmented pictures are shown that eventually depict objects. Hasty decisions often lead to errors and new evidence discourages certain alternatives.	The disadvantage of jumping to conclusions is stressed.
3. Changing beliefs [Bias against disconfirmatory evidence]	Cartoon sequences are shown in backward order, which increasingly disambiguate a complex scenario. After each (new) picture, the plausibility of four interpretations has to be re-rated. On some pictures, patients are 'led up the garden path'.	Patients learn to withhold strong judgments until sufficient evidence has been collected, and to consider counter-arguments and alternative views.
4. To empathize I	Pictures of human faces are presented. The group should guess what the depicted character(s) may feel. The correct solution often violates a first intuition.	It is demonstrated that facial expressions can be misleading for social decision-making and that response confidence needs to be attenuated in case of scarce evidence.
5. Memory [Over-confidence in errors]	Complex scenes (e.g. beach) are displayed prompting high-confident false memories for typical items (e.g. memorizing a ball although it has not been presented).	The constructive nature of memory is emphasized. Patients are encouraged to decrease confidence when evidence is lacking.
6. To empathize II [Theory of mind second order]	The perspective of one protagonist must be considered, which involves discounting knowledge available to the observer but not available to the protagonist.	Patients are taught that social situations often lack a clear-cut solution and that multiple pieces of evidence have to be contemplated before a definite decision can be reached.
7. Jumping to conclusions II	Paintings are displayed, for which the correct title must be deduced from four response options. Many pictures elicit false responses.	The disadvantages of hasty decision making are emphasized.
8. Mood and self-esteem	Typical depressive cognitive patterns are presented (e.g. over-generalization), and the group is asked to come up with more constructive and positive ones.	Strategies for raising and maintaining self-esteem are conveyed.

biases proposed by MCT's developers: over-confidence in errors (Moritz & Woodward, 2006; Moritz et al., 2008) and a bias against disconfirmatory evidence (Sanford, Veckenstedt, Moritz, Balzan, & Woodward, 2014; Woodward, Buchy, Moritz, & Liotti, 2007; Woodward, Moritz, Menon, & Klinge 2008).

As presented in more detail in the manual, MCT and MCT+ target patients with positive symptoms. It is advised that patients either display delusional symptoms currently or have displayed these symptoms in the past. As group settings can be disrupted by behavioral disturbances, patients with very severe forms of delusions, formal thought disorder and hostility should refrain from participating in MCT until some remission has taken place. Here, MCT+ or individualized CBT may be offered to the patient instead.

In short, MCT aims to sow the seeds of doubt through corrective ("aha!") experiences in an entertaining, playful and collaborative manner. By presenting predominantly neutral (non-delusional) scenarios, MCT aims to shake (some of) the cognitive foundations of delusions, which is hoped to ultimately lead to the crumbling of delusional conviction. Cognitive biases, particularly jumping to conclusions and overconfidence, are regarded as basic driving mechanisms that turn (initially) benign false judgments into perpetuated delusional systems. The various modules of MCT demonstrate to patients that complex events can have very different explanations and are rarely determined by single causes (modules 1 and 6), that evidence can change over time (module 3) and that one should not jump to conclusions or be too confident in judgments, particularly in situations with potentially momentous outcomes (modules 2, 4, 5, 7). This is achieved by a dialectic approach. On the one hand, each module aims to normalize these cognitive biases to some degree by running through everyday examples that demonstrate the fallibility of human cognition per se. This is an important feature because it has been demonstrated that normalization and reduction of stigma can foster treatment engagement for psychotherapy (Lullmann & Lincoln, 2013). However, it is also brought to the patient's attention that these cognitive biases are exaggerated in many patients, potentially creating problems in social

interaction, and possibly contributing to psychotic symptoms. Thus, the intervention aims to make the causes/origins of psychotic symptoms more understandable instead of demonizing them, thereby possibly reducing stigma and increasing hope and self-efficacy. We propose that MCT may reduce delusions by training patients to be less confident in their judgments and to seek more evidence. For most language versions, two parallel cycles exist.

The aim of the present article is to provide a narrative review of studies conducted on MCT and its variants.

2. Methods

This narrative review is based on the literature that came to our attention on or before December 31st, 2013. We took several approaches to compiling literature for this review. First, as the two main developers of MCT are authors on this review, we were informed by the first authors of most studies upon completion of their trials. In addition, we asked individuals who translated MCT about research activities in their countries. Finally, we searched scientific databases (i.e., MEDLINE/pubmed.com, PsycLit and Psynindex) with the following terms: (psychosis or psychotic or schizophren*) and (metacogn* or reason* or "cognitive bias*") and (training or therap*); however, this yielded no new findings relevant to the present review. Studies conducted on metacognitive therapy (MCT) by Adrian Wells, a generic and very different concept despite a similar name, were not considered. We included both controlled and uncontrolled trials, whereby only the former studies receive special weight and are summarized in Table 2.

3. Results

3.1. Studies on MCT

A number of mostly small to medium-sized studies have investigated the acceptance and efficacy of metacognitive training. All completed

Table 2
Studies on MCT for psychosis.

Authors	Sample	RCT	Diagnosis, in- or out-patient program	Format	blinded	Measurement	Effect on positive symptoms [0, (+), +]	Effect on objective biases [0, (+), +]	Effect on subjective biases [0, (+), +]	Subjective appraisal [0, (+), +]	Main findings and limitations
<i>Group training</i>											
Moritz & Woodward, 2007 (*)	N = 40; MCT vs. (CogPack)	yes	Sz spectrum outpatients	group	subjective assessment only	retrospective assessment after four weeks	n.a.	n.a.	n.a.	+	MCT > control on 4 out of 10 subjective parameters (e.g., less boring, fun, useful to daily routine). Study did not address efficacy.
Aghotor et al., 2010 (*)	N = 30; MCT versus active control (discussion of articles)	yes	Sz spectrum inpatients	group	yes	baseline, four weeks	(+)	(+)	n.a.	+	No significant group effects. Weak-to-medium effects in favor of MCT for JTC, positive symptoms and medium effects for subjective training success. Underpowered trial; active control condition received lower treatment dosage
Kumar et al., 2010	N = 16; MCT (adapted to cultural differences) vs. TAU	yes	paranoid Sz inpatients	group	yes	baseline, after two and four weeks	(+)	n.a.	n.a.	n.a.	MCT > control on conceptual disorganization and tension. Medium-to-large effect sizes on PANSS positive scale and BABS subscales (but n.s.), underpowered trial
Moritz, Kerstan, et al., 2011 (*)	N = 36; MCT versus wait-list	yes	Sz spectrum in- or out-patients	group	yes	baseline, end of training (≈8 weeks)	(+)	(+)	n.a.	+	MCT > control for delusion distress, memory and social quality of life. No differences occurred on the PANSS. Data gathering improved at a medium effect size. 100% completion rate, mainly chronic patients, approx. half fulfilled criteria for substance abuse or dependence
Naughton et al., 2012	N = 27; MCT versus wait-list	no	mainly Sz patients, from forensic mental hospital	group	no	9/2009 prior to treatment, 3/2010 after treatment	(+)	n.a.	n.a.	n.a.	MCT > control on capacity to consent to treatment (correlated with the number of sessions attended) and GAF scores. No changes on PANSS. Authors acknowledge non-RCT design and small sample as limitation. Three did not meet criteria for schizophrenia.
Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013; Moritz, Veckenstedt, Bohn, Köther, et al., 2013; Moritz et al., 2014 (*)	N = 150; MCT vs. CogPack	yes	Sz spectrum in- or out-patients	group	yes	baseline, after one cycle (≈four weeks), six months, three years	+	0	n.a.	+	MCT > control on PANSS delusion subscore (primary outcome; follow-up), positive score (post-treatment) and PSYRATS delusion score (post-treatment and follow-up). Improvement on PANSS positive scale at post and follow-up positively correlated with number of attended MCT sessions. No changes seen for other psychopathological syndromes. After three years, "sleeper effects": MCT > control on self-esteem, PANSS total score and quality of life. MCT > control for PSYRATS delusions and PANSS positive syndrome. No significant differences on JTC
Kuokkanen et al., 2014	N = 20; MCT versus TAU	yes	Sz inpatients with a history of violence	group	yes	baseline, 4 weeks, 3 months, 6 months	+	-	n.a.	n.a.	MCT > control on PANSS suspiciousness, largest difference at 3 months. By the 6-month follow-up, difference declined but still significant. No significant improvement in reasoning ability was achieved. Only a small male sample was examined.
Favrod et al., 2014 (*)	N = 52; MCT versus TAU	yes	Sz spectrum outpatients	group	yes	baseline, 8 weeks, 6 months	+	n.a.	n.a.	n.a.	MCT > TAU on PANSS positive, PSYRATS and SUMD awareness of delusions (medium-to-strong effect size for both post and follow-up). For hallucinators, similar results on PSYRATS hallucinations subscale
Lam et al., 2014	N = 80; MCT vs TAU	yes	Sz spectrum in- or outpatients	group	self-report scale	baseline, after training (4 weeks alter)	n.a.	n.a.	+	+	MCT > TAU on BCIS self-reflectiveness and total score as well as general self-efficacy (large effect size). No symptoms were assessed.

(continued on next page)

Table 2 (continued)

Authors	Sample	RCT	Diagnosis, in- or out-patient program	Format	blinded	Measurement	Effect on positive symptoms [0, (+), +]	Effect on objective biases [0, (+), +]	Effect on subjective biases [0, (+), +]	Subjective appraisal [0, (+), +]	Main findings and limitations
van Oosterhout et al., 2014 (*)	N = 154; MCT vs. TAU	yes	Sz spectrum patients	group	yes	baseline, after 8 weeks, after 24 weeks	0	n.a.	0	n.a.	Decrease in symptoms for both groups. MCT not superior to control on delusions (PSYRATS, GPTS), cognitive insight, cognitive biases and health care costs. All patients displayed at least for moderate-to-severe delusional symptoms as assessed by GPTS which may have compromised comprehension. State of the art methodology was adopted.
Briki et al., 2014	N = 50 (analyzed), MCT versus Supportive Therapy (ST)	yes	Sz spectrum in- or out-patients	group	yes	baseline, after 8 weeks	(+)	n.a.	n.a.	(+)	MCT > ST on PANSS positive syndrome, trend in favor of MCT for insight on hallucinations and social functioning
<i>Individualized training or blended versions</i>											
Moritz, Veckenstedt, Randjbar, Vitzthum, & Woodward, 2011 (*)	N = 48; MCT/ MCT+ versus CogPack	yes	Sz inpatients	individual (MCT+) and group (MCT)	yes	baseline, four weeks	+	+	n.a.	+	MCT > control for PANSS delusion subscore and 2/3 positive scores, JTC, PSYRATS delusions conviction (medium-to-strong effect); no effect on total score. Weak-to-medium effect for PSYRATS; excellent subjective appraisal. Trial tested beta version of MCT+.
Ross et al., 2011	N = 34; single session Reasoning Training versus active control	yes	Sz spectrum; in- or out-patients	individual	no	before, after training	(+)	(+)	n.a.	n.a.	Data-gathering but not JTC improved in reasoning group; less conviction and belief flexibility in reasoning group after training. Routine scales like PANSS were not administered.
Rocha & Queirós, 2013	N = 35; MCST (MCT+ SCIT; 18 sessions) versus TAU	non-random allocation	Sz outpatients	group	unclear	baseline, after training (10 weeks program)	0	+	n.a.	n.a.	MCST > TAU for JTC and some measures of ToM, social perception, functional outcome and emotion recognition. Trend for general symptoms. No effects on positive and negative symptoms. Trial cannot tease apart contribution of MCT versus social cognition training.
Balzan et al., in press (*)	N = 28; MCT single session (exercises modules 2,3 and 7) versus wait-list	no	Sz outpatients	individual	no	baseline, 2 weeks after treatment	+	+	(+)	+	MCT > control on positive symptoms (PANSS, SAPS, PDI), including delusional severity and conviction as well as QoL and cognitive bias performance. Insight ameliorated for SAI but not BCIS. Patients were on antipsychotic medication for least 12 months
Erawati, in press	N = 56; MCT versus TAU	no	Sz spectrum inpatients	individual	no	baseline, after four weeks	+	n.a.	+	+	MCT > TAU on PSYRATS delusion subscale and self-devised metacognition self-report scale (MAQ) at a very large effect size. Excellent adherence and subjective appraisal. Group MCT slides used for individual administration; allocation to treatment based on patient's preference. Non-RCT trial.

(0 = no support; (+) = partial support; + (predominant) support.)

BAPS = Brown Assessment of Beliefs Scale; CBQp = Cognitive Biases Questionnaire for Psychosis; GPTS = Green Paranoid Thoughts Scale; JTC = jumping to conclusions; PDI = Peters et al. Delusions Inventory, QoL = quality of life; SAI = schedule for assessing insight; SAPS = Scale for the Assessment of Positive Symptoms, SUMD = Scale to Assess Unawareness in Mental Disorder; SZ = schizophrenia; TAU = treatment as usual; ToM = theory of mind.

(*) = study planned, conducted and/or published with the help of at least one of the main developers.

>significant difference.

trials that have come to our attention, including several not yet published studies, are summarized in Table 2. Most of these studies have examined the standard group training. Some assessed abbreviated MCT versions, mixed therapy programs that blended MCT with other approaches, or individualized versions of MCT (either the individualized metacognitive therapy program MCT+ or group MCT modules tailored to the needs of individual patients). The next sections will focus on the acceptability of the intervention, and its effectiveness on positive symptoms and cognitive biases. Other domains either are beyond the scope of the training (e.g., negative symptoms) or have been addressed by too few studies to allow clear-cut inferences.

3.2. Safety and acceptance

Following a feasibility trial (Moritz & Woodward, 2007) conducted in Hamburg (Germany), several (subsequent) studies have asserted the safety and acceptance of MCT. All of the studies that assessed patients' appraisals (mainly with the 10-item questionnaire used in the initial study) showed that MCT is well received by patients (Aghotor, Pfueller, Moritz, Weisbrod, & Roesch-Ely, 2010; Balzan, Delfabbro, Galletly, & Woodward, *in press*; Briki et al., 2014; Erawati, *in press*; Favrod, Maire, Bardy, Pernier, & Bonsack, 2011; Favrod et al., 2014; Ferwerda, de Boer, & van der Gaag, 2010; Lam et al., 2014; Moritz, Kerstan, et al., 2011; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013; Moritz, Veckenstedt, Randjbar, Vitzthum, & Woodward, 2011). The intervention is considered to be fun by at least three out of four patients and participants would recommend it to other individuals with schizophrenia. Although enjoyment and subjective benefit are secondary outcome parameters, we deem them important prerequisites in view of the frequent avolition, poor motivation and affective flattening in the target population that are risk factors for non-adherence. However, one limitation is that not all patients with schizophrenia display all cognitive biases addressed in MCT and, as such, it may be that not all modules are equally relevant for all group members.

3.3. Delusions and positive symptoms

Table 2 shows that except for one important exception (van Oosterhout et al., 2014) discussed below, most studies report that MCT improves symptoms. The magnitude of change observed ranged from small (Aghotor et al., 2010) and medium (Briki et al., 2014; Favrod et al., 2014; Gawęda, Krężolek, Olbryś, Turska, & Kokoszka, 2014; Kumar et al., 2010; Kuokkanen, Lappalainen, Repo-Tiihonen, & Tiihonen, 2014; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013; Moritz, Veckenstedt, et al., 2011) to large effect sizes (Balzan et al., *in press*; Erawati, *in press*) with respect to MCT's effects on positive symptoms. Also, uncontrolled trials found strong effects on positive symptoms (Favrod et al., 2011). Factors contributing to differences in effect sizes include between-study differences in the primary outcome measure. Effects on delusion severity or other delusion dimensions (Moritz, Kerstan, et al., 2011) as assessed with the PSYRATS (Haddock, McCarron, Tarrier, & Faragher, 1999) and/or PANSS (Kay, Opler, & Lindenmayer, 1989) tended to be larger. While some studies report improvement on both scales (Favrod et al., 2014; Ferwerda et al., 2010), in others, the PSYRATS was more sensitive than the PANSS (Moritz, Kerstan, et al., 2011; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013), and in two studies, the opposite was true (Briki et al., 2014; Moritz, Veckenstedt, et al., 2011). These discrepancies might be attributable to subtle differences between the two rating scales. The PSYRATS is more fine-grained and distinguishes different aspects of delusions and hallucinations (such as conviction and distress) that are pooled in PANSS items P1 (delusions) and P3 (hallucinations). However, patients sometimes underreport symptoms at baseline because of lack of insight and mistrust, causing real improvement to falsely manifest as objective decline. The PSYRATS is perhaps more prone

to such errors than the PANSS as it more heavily relies on self-report. Further controlled studies that use uniform outcome measures are needed to clarify MCT's impact on positive symptoms and to determine effect size.

The abovementioned studies investigated the short-term efficacy of MCT, assessing changes in symptoms and cognitive biases immediately upon completion of the intervention. Two trials (Favrod et al., 2014; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013) also speak for the long-term efficacy of MCT, up to six months after the intervention. The latter trial detected "sleeper effects" three years after the intervention: the PANSS total score (as well as quality of life subscores and self-esteem) distinguished MCT participants from the active control group, while there were no differences in these outcome parameters between the two interventions at prior assessment points (Moritz et al., 2014).

Positive effects on symptoms have also been found with similar programs (Ross, Freeman, Dunn, & Garety, 2011), such as the Maudsley Review Training Program (Waller, Freeman, Jolley, Dunn, & Garety, 2011), a computerized training package with five tasks relating to JTC, where two of these tasks are similar to module 2 of MCT (one task set was directly taken from module, the other from the Ross et al. study, which was later incorporated into MCT). A Portuguese study (Rocha & Queirós, 2013) blended MCT with Social Cognition and Interaction Training (SCIT; Combs et al., 2007) and found some improvements in general but not positive symptoms.

A Dutch trial (van Oosterhout et al., 2014) showed no advantage of MCT over TAU on any outcome measure. Also, improvements for the MCT group were smaller, particularly for the PSYRATS delusion (3.5 versus 1.6 points improvements) and GPTS total score (16.9 versus 14.7 points improvement), than in the forerunner trial conducted by the same group (Ferwerda et al., 2010). As can be seen in Table 2, the trial by van Oosterhout et al. recruited a large sample and used an earlier version of MCT (later versions place more emphasis on the importance of doubt for decision-making, and encourage participants to revise their judgment if evidence is weak and consequences are momentous). One possible limitation of this study is that the primary outcome was a self-report scale. Underreporting of symptoms is common in patients prior to therapy, mainly because of mistrust, poverty of speech and lack of illness insight. As these confounds decline over time, this may lead to the paradoxical effect of an apparent increase of symptom severity when in fact symptoms have improved. More importantly, the study only included subjects with medium or high delusion levels. Although at first glance this appears reasonable for a training aimed at improving delusions, from a clinical standpoint and in our experience, it is problematic for a group setting as participants are often easily distracted, or disturb other members by making inappropriate comments. Accordingly, we recommend that patients should start the training only once sufficient clinical stability is reached.

3.4. Cognitive biases

Most trials investigating the impact of MCT on cognitive biases focused on the jumping to conclusion bias. As Table 2 shows, some (Aghotor et al., 2010; Balzan et al., *in press*; Ferwerda et al., 2010; Moritz, Kerstan, et al., 2011; Moritz, Veckenstedt, et al., 2011; Ross et al., 2011; Waller et al., 2011), but not all, studies (Gawęda et al., 2014; Kuokkanen et al., 2014; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013) found that MCT or variants of it improve data gathering or jumping to conclusions at least at a weak-to-moderate effect size. Data by Köther et al. (submitted), which was derived from another trial (Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013), reported that overconfidence in errors was ameliorated to a larger extent in the MCT relative to the CRT group after six months of treatment. Positive effects of MCT were also detected for the representativeness and illusion of control biases (Balzan et al., 2014). Evidence from three trials tentatively suggests that individualized training versus group training may be more effective at correcting this rather deep-rooted bias (Balzan

et al., 2014; Moritz, Veckenstedt, et al., 2011; Ross et al., 2011). Further work is needed to examine if biases other than JTC are affected by MCT interventions.

Cognitive insight or metacognition has been captured with different instruments, for example the Beck Cognitive Insight Scale (BCIS), which showed improvements in some (Erawati, in press; Ferwerda et al., 2010; Gawęda et al., 2014; Lam et al., 2014) but not all trials (van Oosterhout et al., 2014). One trial found greater improvement in clinical but not cognitive insight (Balzan et al., 2014). An Indonesian study (Erawati, 2014) yielded very large effects using the self-devised Metacognitive Abilities Questionnaire (MAQ), whereby it must be noted that no RCT design was adopted in this trial.

3.5. Limitations

Table 1 shows that for some trials, the developers of the intervention either conducted the studies or were otherwise involved. Despite blinded assessment in most trials, allegiance effects cannot be fully ruled out, although positive effects of similar magnitude were reported by studies that were planned, carried out and published without the involvement of the developers or team members (e.g. Erawati, 2014).

We chose to compile the existing data on MCT by means of a narrative review rather than a meta-analysis as studies differed across essential parameters, most importantly outcome measures (PSYRATS, PANSS positive or adapted scores) and the variations administered (the exact edition of group MCT used is often not stated; shortened and blended versus full versions; MCT performed in groups versus individually). Some studies – including our own – face the problem that overlapping outcome parameters were adopted (e.g., PANSS versus PSYRATS), which do not always yield consistent results. Although multiple measures capturing the same outcome could be considered a limitation of previous studies, it is a necessity when assessing the efficacy of a new treatment, as little is yet known about mechanisms of action. At this stage, the use of these overlapping measures tapping objective and subjective cognitive biases allows us to better understand the mechanisms through which MCT might ameliorate delusions. One virtue of MCT is that it is free to download and available in a variety of languages, which has fostered its dissemination; however, this also creates obvious problems with regard to methodological rigor. Trials were administered by therapists from different professions including occupational therapists (Lam et al., 2014), nurses (Erawati, 2014; Favrod et al., 2011, 2014) and psychologists (Moritz, Kerstan, et al., 2011; Moritz, Veckenstedt, Bohn, Hottenrott, et al., 2013; Moritz, Veckenstedt, et al., 2011). Few therapists were trained by the developers of MCT, and there is no formal training curriculum. Therefore, the degree of adherence to the manual is unknown. However, even studies without such standardized protocols reported positive results. As standardization of therapy administration and treatment experience will likely increase the efficacy of the treatment for future trials, we aim to provide a curriculum for trainers to teach them the basics of MCT first hand for the future.

A further problem relates to the narrow scope of the training, as MCT addresses only positive symptoms. To achieve comprehensive treatment success, therapists are advised to blend MCT with other procedures that successfully target negative symptoms, disorganization, social and cognitive impairment. While negative symptoms are not disorder specific, these are the symptoms patients suffer from most (Rosenheck et al., 2005). A newer version of the MCT group training (edition 5.0) as well as MCT+ incorporate novel exercises dealing, for example, with social problems (e.g., group rules are posted during each session that teach patients to be considerate about other people's opinions and to avoid monologues), and exercises should be tailored more to individual problems in order to involve patients with comprehension difficulties; MCT+ directly addresses problems with volition and other negative symptoms. Notwithstanding these efforts, the effect

of these changes has not yet been established. Finally, we need to know more about differential indicators, that is, who benefits from training and who does not.

3.6. Conclusions and future directions

So far, the evidence for MCT is encouraging, but remains preliminary. Table 2 shows that most studies provided support for the efficacy of MCT for the treatment of positive symptoms, as well as the amelioration of objective and subjective cognitive biases. Studies, particularly those using the new and improved versions of MCT and MCT+, confirm that the intervention exerts a (close to) medium effect size on positive symptoms over and above the effect of antipsychotic medication.

Currently, we are working on identifying neural regions that are affected by MCT, and if MCT/MCT+ ameliorates positive symptoms in patients who are either resistant to antipsychotics and/or reject taking antipsychotic medication. Trials have also begun to blend MCT with other programs, such as SCIT (see Rocha & Queirós, 2013). Colleagues have also started to add additional modules to the 8-module package, for example on trust and cognitive biases (Balzan et al., 2014). We fully endorse such hybrid packages. In our experience, group MCT may also facilitate the administration of CBT, as it provides a theoretical framework and shared terminology that the therapist and patient can refer to. We have now begun to expand the MCT concept to other disorders (e.g., <http://www.uke.de/mymct>; <http://www.uke.de/borderline>). As some biases, particularly attributional biases and negative cognitive schemata, are transdiagnostic, some overlap exists among the different treatments.

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