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Critical review

Treatment

A critical review of metacognitive training (MCT) for psychosis: Efficacy, proposed mechanisms of action and significance for functional outcomes

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Abstract

Introduction

Despite significant advances in antipsychotic medications, schizophrenia continues to be a highly disabling condition. Many patients go untreated, are treatment resistant or receive inadequate treatment. A large body of work has demonstrated that cognitive biases (e.g., jumping to conclusions [JTC], overconfidence in errors, bias against disconfirmatory evidence) are involved in the formation of delusions in schizophrenia and thus represent a possible target for intervention. The following article provides a critical review of metacognitive training (MCT) for psychosis.

Discussion

MCT is a variant of cognitive behavioural therapy (CBT) that seeks to both normalize and increase awareness about cognitive processes involved in the emergence of symptoms utilizing strategies that induce doubt in delusions by addressing cognitive biases, while also instilling hope. Randomized controlled trials using blind raters have mainly yielded moderate effects, which in one study were maintained up to three years after treatment. MCT is positively rated by patients signaling that it is useful, fun and the rationale is understood by patients. Further work is needed to clarify whether the JTC bias represents a unique mechanism of action of MCT that may account, in part, for its effects beyond antipsychotic medication.

Conclusion

We conclude that MCT represents a promising new direction in intervention research for psychosis that can complement standard treatment approaches.

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Introduction

Schizophrenia is a chronic disorder that affects approximately 1% of the population worldwide[1] and is among the world's most disabling conditions[2].

Despite significant improvements in antipsychotics and treatment approaches for schizophrenia, their effect on symptom reduction remains moderate[3]. Due to factors including limited insight, memory problems, adverse effects, and mistrust of the clinician, discontinuation rates of antipsychotic medication are typically quite high[4,5]. Additionally, up to 30% of patients are treatment resistant[6] and less than 15% of all patients recover completely[7].

These observations have led to increased interest in adjunctive psychological treatments that might reduce symptoms resistant to or not effectively treated by medication. Indeed, treatments such as cognitive-behavioural therapy for positive symptoms (CBTp)[8] and cognitive remediation (CR)[9] have yielded small to medium effects on symptoms beyond antipsychotic medication alone. Metacognitive training (MCT)[10,11] draws from concepts used in CBT, CR and psychoeducation.

Like these approaches, it aims to target psychotic symptoms, but does so through a "backdoor approach" that seeks to both normalize and increase awareness about cognitive processes involved in the emergence of symptoms. MCT is founded upon a huge body of empirical work that has demonstrated generalized cognitive biases in schizophrenia, including jumping to conclusions[12,13,14] (Figure 1), bias against discriminatory evidence (BADE)[15,16], attributional distortions [17,18] , and overconfidence in errors[19] (Figure 2). MCT also targets Theory of Mind (ToM) deficits that are common in psychosis[20].

In particular, delusions, defined as fixed false beliefs that are held with high conviction, are among the most challenging symptoms to treat and were once thought to be psychologically inaccessible[21,22]. Rather than viewing delusions as absurd thoughts that emerge without a meaningful context, the concept of cognitive biases implies that delusions result from specific disruptions in the normal cognitive processes for belief generation and evaluation, and thus might be amenable to specific psychological interventions[23].

Though antipsychotic medication creates detachment from delusions, potentially through a "numbing" effect[24], it does not directly alter underlying cognitive processes; thus, MCT aims to address delusions in a manner complementary to that of antipsychotic medication. We will present a hypothesis of the proposed "mechanism of action" used by MCT to address cognitive biases, and therefore

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delusions, in the second half of this review.

Discussion

The authors have referenced some of their own studies in this review. These referenced studies have been conducted in accordance with the Declaration of Helsinki (1964) and the protocols of these studies have been approved by the relevant ethics committees related to the institution in which they were performed. All human subjects, in these referenced studies, gave informed consent to participate in these studies.

Metacognitive Training for Psychosis (MCT)

As MCT has been extensively described elsewhere[10,25,26], only a brief description of the modules and aims will be provided here.

The training (2 sets of 8 modules each for most versions) aims to sow the "seed of doubt" in patients in an entertaining, playful and collaborative manner through corrective experiences. Cognitive biases are addressed through the eight modules, including: attributional distortions (module 1), jumping to conclusions (modules 2 and 7; Figure 1), bias against disconfirmatory evidence (module 3), and over-confidence in memory errors (module 5; Figure 2).

Two modules (4 and 6) deal with deficits in theory of mind and the importance of cognitive biases when making social inferences, in light of research suggesting a central role of social cognition deficits for functional outcome in schizophrenia[27].

To address the high rates of affective disturbance (approx. 50%)[28], depressive cognitive patterns are also discussed (module 8). An example of topics covered in Modules 2 and 7 is presented in table 1.

To avoid directly confronting delusions and dysfunctional coping skills, each module begins with psychoeducational elements and attempts to "normalize" cognitive distortions through examples of the fallibility of human cognition that all people experience. This is an important feature, as normalization has been demonstrated to foster treatment engagement for psychotherapy[29].

Using a dialectic approach, the next step of MCT examines how exaggerated (pathological) fallacies of normal thinking can lead to problems in daily life and possibly delusions in individuals with schizophrenia. These fallacies are illustrated with real-world examples of people with psychosis, and opportunities for group participants to exchange their own experiences are provided.

Therefore, differing from the traditional CBT approach, rather than beginning at the level of symptoms, the "seed of doubt" is sowed in a neutral context with the hope that through multiple examples and discussion of personal experiences, patients will gradually gain insight into the dysfunctional nature of their delusions. The ultimate goal is to provide patients with practical strategies while at the same time instilling hope. An individualized version of the intervention also exists[30] (MCT+, free download at www.uke.de/mct_plus) during which patients may explore specific symptoms and target cognitive biases most relevant for them. MCT is currently available at no cost in currently 30 languages.

Current state of the literature

While most studies have examined the standard group training, abbreviated or modified versions of the therapy have also been used, such as those that have blended MCT with other interventions or have used MCT+.

Overall, the effect sizes yielded by these studies are comparable to that of other therapeutic approaches to the treatment of schizophrenia[31]. Providing further evidence of the potential for MCT as a complementary intervention, all studies used MCT as an add-on treatment to antipsychotic medications. This suggests that MCT's effects may target a separate set of processes than antipsychotics or perhaps enhance medication effects. To this end, our group is currently examining the effects of MCT on unmedicated patients. Following is a brief review of the efficacy of MCT for positive symptoms (for a detailed review of all existing and forthcoming studies on the efficacy of MCT, see Moritz et al.[32]).

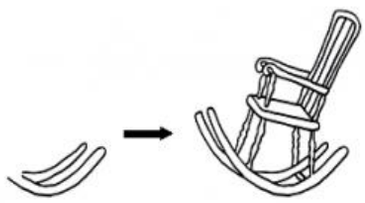

Figure 1: Elephant tusks or a rocking chair? In module 2 (jumping to conclusions I), participants are shown a picture in which an object is depicted with increasing detail. Participants are asked to indicate when they are ready to make a decision about what the object is. Hasty decision-making often leads to incorrect judgments on this task.

Of note, as MCT was not designed to target negative symptoms[32], results on these symptoms have generally not been reported.

Feasibility/Safety/Subjective Appraisal

Several studies have demonstrated the feasibility and safety of the group MCT[33,34,35]. Subjective ratings of MCT by patients have been overall positive with patients indicating that they feel as if the training is useful, interesting and an important part of their recovery program[34,35,36,37,38,39].

For example, in the study by Moritz, Kerstan et al., most (85% and 92.9%, respectively) participants indicated that they would recommend the training to others and found the training to be useful and sensible[39]. Given findings that patient ratings of the logicalness of CBT is associated with outcome[40], this patient feedback regarding their experiences with MCT bodes well for the training's effectiveness.

Positive Symptoms

Several short-term studies have demonstrated that MCT has an effect on positive symptoms in schizophrenia with most studies yielding moderate effect sizes (d ≥0.41) [34,38,39,41].

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MCT effects include improvements in positive symptoms as measured by the Positive and Negative Syndrome Scale (PANSS) [34,35,37,39,41], and fewer delusions, as measured by the Psychotic Symptoms Rating Scale (PSYRATS)[34,38,39].

Declines in delusion conviction and improved delusion awareness[34], as well as delusion distress[39], are also reported. MCT participants improve significantly more in these areas than participants in active control groups including treatment as usual[39] and CR[38].

These short-term studies encouraged the design of larger randomized, controlled, rater-blind studies on the long-term effects of MCT. Two studies have been published to date, which used quite different patient samples; while one study included a sample of patients with schizophrenia spectrum disorders of mixed severity (n = 150)[11], the other used more restrictive criteria that included participants only with schizophrenia or schizoaffective disorders, as well as those with persistent delusions[42]. Both studies reported improvements in indices of delusions and positive symptoms in participants receiving MCT compared to control groups at 6-months (d=0.51 to 0.64). Impressively, effect sizes for differences in overall delusions, as well as delusion conviction and delusion awareness between patients in MCT and TAU[42] and cognitive training[11] were maintained or even increased in both studies at 6-months. A recent 3-year follow-up study also found differences in delusions (PSYRATS) and positive symptoms (PANSS); however, for the first time, there was also a significant difference in the PANSS total score[43].

It should be made clear that not all studies have found significant group effects[35,39,41]. Further work is needed to confirm the long-term effects; however, these preliminary findings suggest that the effects of MCT may lead to lasting recovery[32]. Critically, the robustness of the findings is further supported by the fact that, in all of these studies, raters were blind to treatment arm allocation.

Figure 2: In module 5 (memory), participants are asked to study a complex scene for several seconds and then identify which items on a list were or were not present in the scene. They are also asked to rate how confident they are in their decisions. Patients with psychosis tend to be more confident in their memory errors.

"Mechanism of Action" of MCT

Despite the demonstrated effectiveness of MCT, its exact mechanism of action has yet to be confirmed. In some[35,36,38,39,43], but not all[11], of the above studies the beneficial effects of metacognitive interventions on symptoms were accompanied by improvements in delusion-associated cognitive biases, thus providing preliminary support for the hypothesized mechanisms of action of MCT. However, no study has yet directly assessed the effect of the intervention on cognitive biases as a modulator of symptom change. In this section, we first discuss the neurobiological underpinnings of cognitive biases before turning to MCT's proposed "mechanism of action."

In contrast to the abundant literature on cognitive biases in schizophrenia, very few studies have examined their neurobiological underpinnings and their connection to the postulated dopaminergic disturbances underlying psychotic symptoms.

These areas may provide insight into the different mechanisms of action for MCT versus antipsychotic medications and clarify MCT's complementary effect in medicated patients. Recent evidence suggests that the JTC bias is not affected by antipsychotic medication[44], although it may act as a moderator of antipsychotic drug response[44,45]. However, there is evidence that overconfidence in errors correlates negatively with antipsychotic medication dose[46,47] which might imply that it is modulated by dopaminergic activity.

Indeed, a recent study by our group[37] found that a dopaminergic agonist (L-Dopa) and a dopaminergic antagonist (the typical antipsychotic haloperidol) did not affect probabilistic reasoning (which is involved in the JTC bias) in healthy subjects, whereas there was a positive (reducing) effect of haloperidol on error overconfidence compared to L-Dopa.

It is also unknown how cognitive biases relate to the prominent account of delusions that proposes that they result from a (dopaminergically induced) aberrant allocation of salience to random stimuli. The pattern of dopaminergic modulation described above[37] is consistent with a dual-disturbance account of delusion formation[23] which postulates that two types of cognitive disturbances are needed to co-occur in order for delusions to emerge: The first disturbance in the so-called "2-Factor

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Table 1: MCT Example.

Jumping to Conclusions (Modules 2 and 7)

- **Introduction**: what does "jumping to conclusions" (JTC) mean? What are hasty conclusions? What are the advantages and disadvantages of making hasty conclusions?
- **Examples of JTC in everyday life**: examples of when most people make inferences without having enough proof and discussion of whether this is justified (i.e., does hearing bushes rustling mean there is a burglar outside?); considering multiple pieces of information.
- **Examination of JTC "in action"**: real-world examples of JTCs, such as commonly accepted urban legends (e.g., Paul McCartney is dead); evidence for and against these urban legends are discussed.
- **Why are we doing this?**: explanation of how JTC can lead to misinterpretations, particularly in people with psychosis.
- **Cognitive exercises: examples of JTC**: '*What do you see in the picture?*' (Figure 1). Gradual presentation of drawings; use of evidence gathering to interpret optical illusions and paintings. Examination of how hasty conclusions can lead to misinterpretations.
- **Learning points**: review of the major themes from the JTC module, transfer to everyday life when making small (e.g., grocery shopping) or crucial (e.g., confronting a neighbor for supposedly spying) decisions.

Theory"[23] is the generation of an implausible thought, and the second disturbance explains why this thought is uncritically accepted as being true. Thus, it might be assumed that the first type of disturbance corresponds to aberrant salience, whereas the JTC bias comes into play in the second step of this process. It is not clear how overconfidence in errors fits into this account: Conceptually, it would play a role at a later stage of delusion consolidation. However, the association of both overconfidence in errors and salience with dopaminergic activity raises the probability that these disturbances reflect two facets of the same core deficit. Indeed, recent functional neuroimaging studies suggest that subjective confidence may reflect self-generated dopaminergic signals in the reward system[48]. Though not yet tested, this may provide a possible link between overconfidence and salience.

In summary, some initial evidence suggests that the effects of MCT on the JTC bias may be considered unique and independent of those of antipsychotic medication, whereby this has not been consistently support. In contrast, MCT's effects on error overconfidence might be similar or complementary to those of medication. However, these hypotheses are preliminary, as a direct comparison of MCT as monotherapy versus antipsychotic drug treatment is lacking.

Functional Deficits

Functional deficits in schizophrenia have been well-established and schizophrenia ranks sixth among the top 10 causes of disability[2]. MCT has been shown to be associated with improvements in social relationships[39], depression[34,43], quality of life[43] and, in a forensic patient population, functional mental capacity (i.e., the ability to exercise legal rights)[49].

The aforementioned cognitive biases targeted by MCT may represent the link between functional deficits and specific symptoms or behaviours in schizophrenia. For example, in a study by Köther et al.[50], patients with schizophrenia not only made more false judgments than healthy controls in interpreting the mental state of others, but they also made significantly more high-confident errors and demonstrated decreased insight into their impairments[50]. This may very well have functional implications: A higher conviction in false judgments about the intentions or thoughts of others, especially when accompanied by delusions or paranoia, may lead to behavioural consequences (e.g., withdrawal, confrontation) and emotional distress (e.g., panic, anger)[51].

For example, Moritz & Van Quaquebeke[51] found that conviction in one's paranoid beliefs (i.e., being pursued by the secret service), directly related to the subsequent actions (i.e., deleting internet traces [low conviction], buying a bullet-proof vest [high conviction] or even arming oneself [very high conviction]). The assumption that cognitive biases are relevant for functional outcomes is supported by recent work on JTC and functioning by our group demonstrating that improvements in JTC positively affected vocational outcomes[52]. Therefore, though the main aim of MCT is cognitive biases, change in cognitive biases may lead to improved psychosocial functioning.

Conclusion

Taken together, MCT represents a new and promising direction for schizophrenia treatment that can complement existing treatment approaches.

Though a number of studies have demonstrated the feasibility, acceptance and effectiveness of MCT on positive symptoms, findings are preliminary and most sample sizes remain small.

However, moderate effects suggest that MCT leads to increased improvement beyond antipsychotic medication, and preliminary findings from one long-term study indicate that this improvement is long-lasting. Current studies examining the efficacy of MCT in unmedicated patients, as well as studies using updated, shortened or blended versions of MCT and MCT+ will provide clearer evidence of MCT's effects.

Much remains to be clarified about MCT's mechanism of action and we hope that future work will be aimed at

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further identifying the connection between changes in positive symptoms, cognitive biases (particularly, if and how cognitive biases other than jumping to conclusions may be effected by MCT) and functional status.

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