


BRIEF REPORT

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Metacognitive training for negative symptoms: Support for the cognitive model

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Abstract

Developing effective treatment options for negative symptoms of psychotic disorders remains a major unmet treatment need and area for further research. In a recent uncontrolled study by the main author, Metacognition Training (MCT) for negative symptoms was found to lead to fewer negative symptoms, less stigma and increased self-rated reflective ability. As the analysis examined negative symptoms as a whole, we here performed an additional analysis on individual negative symptom items as recent research has suggested that negative symptoms are best conceptualized through a five-factor model. It was found that the intervention led to changes specifically on sociality and blunted affect (with large effect sizes), which might reflect changes in both intrapersonal and interpersonal (meta)cognitive processes.

KEYWORDS

depression, mentalization, metacognitive training, negative symptoms, stigma

1 | INTRODUCTION

Negative symptoms in schizophrenia refers to a lessening of behaviours and functions related to verbal/emotional expression, motivation and interest. These symptoms are common in schizophrenia as up to 60% of the individuals with the diagnosis have clinically relevant symptoms that would need treatment. The domain has through structural equation modelling (SEM) been found to consist of five key constructs: avolition (reductions in goal-directed activity caused by decreased motivation), blunted affect, alogia (reduction in quantity of words spoken), asociality and anhedonia (reductions in experienced pleasure), where some studies have narrowed these down further into two main factors through factor modelling: decreased emotional expression (EXP) and motivation and pleasure (MAP) (Ahmed et al., 2022).

Evidence-based treatment options for negative symptoms are limited (Correll & Schooler, 2020). To target this treatment gap, a modified version of metacognitive training (MCT) for psychosis (Moritz et al., 2014) was developed by Swanson et al. (2021) to address the defeatist and asocial beliefs thought to be involved in the development

and maintenance of negative symptoms according to the cognitive model (see Beck et al., 2019). The cognitive model proposes that negative symptoms might be caused and maintained by dysfunctional beliefs arising as a consequence of repeated failures and setbacks. These appraisals might include negative beliefs about social affiliations; low expectations of pleasure, success and acceptance; defeatist beliefs about performance; and a perception of limited resources.

The rationale for adapting MCT to negative symptoms is based on studies demonstrating a link between metacognition and negative symptoms, as limitations in complex metacognitive processes predict negative symptoms (particularly on blunted affect and poor rapport) in first episode psychosis 3 years later (Austin et al., 2019). Metacognitive deficits are also found associated with concurrent and future negative symptoms when controlling for verbal memory and education (Faith et al., 2020; Lysaker et al., 2020). This suggests that negative symptom reduction may at least partially depend on improved metacognitive capacity, and that a metacognitive intervention specifically targeting negative symptoms may be beneficial. Metacognitive training is a psychological intervention aiming to improve metacognition in

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the hope to alleviate persistent psychotic symptoms by combining cognitive bias modification, psychoeducation and techniques borrowed from cognitive behavioural therapy (CBT). A recent study (Shan et al., 2020) found that individuals taking part in MCT showed alterations in the default-mode network (DMN), which is thought to be responsible for thinking about self-mental states and others' internal world (Yeshurun et al., 2021), indicating that the intervention does lead to functional brain changes relating to metacognition.

Although it was found in a recent meta-analysis (Penney et al., 2022) that MCT showed benefits up to 1 year postintervention, only a small effect size was found for negative symptoms. We therefore adapted MCT for negative symptoms to assess the acceptability and feasibility of the intervention and to identify mechanisms of change (Swanson et al., 2021). We found in the initial evaluation study that after eight sessions, participants ($N = 10$) had fewer negative symptoms (as measured by the Brief Negative Symptom Scale (BNSS) (Kirkpatrick et al., 2010)), with large effect sizes. The treatment effect was hypothesized to be mediated by less stigma (as measured by the Personal Belief about Illness Questionnaire (PBIQ); Birchwood et al., 1993) and increased reflective ability (as measured by the Reflective Function Questionnaire (RFQ); Fonagy et al., 2016).

In our previous study, the analysis examined negative symptoms as a whole. However, there is strong evidence suggesting that the construct is multi-dimensional (Ahmed et al., 2022; Kaiser et al., 2017) and that using a single score (which many studies on negative symptoms typically do) is not supported by external validation and factor analytic studies. For instance, it is possible that the intervention had an impact on some specific dimensions of negative symptoms in the previous study (Swanson et al., 2021) that was obscured in the previous analysis. Moreover, it has been suggested that hierarchical and five-factor models are more suited for studying the clinical, psychological and biological correlates of negative symptoms (Ahmed et al., 2022). In the present study, we therefore aimed to perform a follow-up analysis of our previous results, focusing on assessing change over time on the five aspects of negative symptoms measured in the BNSS: anhedonia, asociality, avolition, blunted affect and alogia. In line with the recommendations by Ahmed et al. (2022), a five-factor model was favoured over the previously suggested model with two factors (MAP/EXP) as the cruder approach may mask significant patterns and hamper interpretation of results.

2 | METHOD

For detailed information about participants and study protocol, see Swanson et al. (2021). In brief, a total of 15 individuals (mean age 42.6 years, 13 male) diagnosed with a psychotic disorder (majority with schizophrenia ($N = 13$) of a presumably treatment resistant nature due to their Clozapine medication) took part in a study with a mixed methods case series design where detailed quantitative data on changes over time were combined with qualitative exit interviews to allow a focus on potential mechanisms underlying changes. In the present study we performed an additional analysis on individual negative

Key Practitioner Message

- Metacognitive Training for Negative Symptoms may be a promising intervention to improve negative symptoms.
- Negative symptoms can be improved with interventions targeting depression, internalized stigma and reflective functioning, where the underlying mechanism seems to be increased sociality and less blunted affect.

symptom items on the main outcome variable: the Brief Negative Symptom Scale (BNSS) (Kirkpatrick et al., 2010) to evaluate changes at pre, post and follow-up (12 weeks after). The BNSS was chosen originally as it has little overlap with depression (Strauss et al., 2012) and is developed to measure negative symptoms as defined by the NIMH consensus development conference (i.e. blunted affect, alogia, anhedonia, asociality and avolition). The English version of the test has in several studies been found to have strong inter-rater, test-retest and internal consistency with intra-class correlation coefficients of .91–.94, which is similar to several cross-cultural validation studies (then .088–.98) where the test has been translated to Spanish, Chinese, Italian, German, Turkish, Korean, Portuguese, Polish and Danish (Tatsumi et al., 2020). Though missing data on questionnaires were replaced with case-mean substitution if fewer than 20% of the items were missing in the original study, there were no missing data to be handled in the current study as the BNSS is based on an interview template.

Metacognitive training for negative symptoms consisted of eight sessions in total, delivered by the main author (LE) (who was trained in MCT) individually as there is evidence indicating that this approach may lead to stronger effect sizes than delivery in a group format (Liu et al., 2018). The intervention consisted of a psychoeducational introduction on negative symptoms, self-esteem, jumping to conclusion, attribution style, cognitive difficulties, social cognition, mood and stigma (see Table 1). Though some of the strategies suggested for negative symptoms in the modified MCT have traditionally been used to target positive symptoms (see Table 1), it is assumed that the same reasoning styles lead to negative symptoms through the dysfunctional cognitions discussed previously (e.g., jumping to conclusions in regard to social rejection and a dysfunctional attribution style reinforcing social withdrawal).

Non-parametric tests (Wilcoxon Signed Rank) were used to evaluate changes at pre, post and follow-up due to the limited sample size and the repeated-measure nature of the data (Field, 2009), with Wilcoxon Signed Rank performed for pairwise comparisons between pre- and post-assessments, and pre-assessments and follow-up assessments. SPSS (version 23) was used for the statistical analysis. The original data collection, which ran between March 2016 and February 2018, received appropriate ethical approval from South East Scotland Research Ethics Committee (reference: 16/SS/0046) and NHS Lothian Research and Development office.

TABLE 1 Summary of the intervention

Session 1	<u>Introduction to negative symptoms</u> Psychoeducation on negative symptoms and how certain unhelpful cognitions might lead to/maintain these; strategies such as monitoring unhelpful cognitions and writing down enjoyable experiences.
Session 2	<u>Self-esteem (taken from the additional modules from original MCT)</u> Psychoeducation on self-esteem and how this might lead to/maintain negative symptoms; strategies such as becoming aware of social comparison, "joy diary", cognitive defusion, and physical distraction.
Session 3	<u>Jumping to conclusions (JTC) (modified from original MCT)</u> Psychoeducation on JTC and how this might lead to/maintain negative symptoms; strategies such as considering alternative interpretations.
Session 4	<u>Attribution style (modified from original MCT)</u> Psychoeducation on how one-sided attribution styles might lead to/maintain negative symptoms; strategies such as considering multiple factors.
Session 5	<u>Cognitive difficulties (modified from original MCT)</u> Psychoeducation on how cognitive difficulties in psychosis may lead to/maintain negative symptoms; strategies such as mnemonics and problem solving.
Session 6	<u>Social cognition (modified from original MCT)</u> Psychoeducation on how difficulties understanding facial expressions might lead to/maintain negative symptoms; strategies such as gaining knowledge from environment/situation, self-observation, and gut feeling.
Session 7	<u>Mood (taken from original MCT)</u> Psychoeducation on how depression may lead to/maintain negative symptoms; strategies such as cognitive restructuring.
Session 8	<u>Stigma (taken from the additional modules from original MCT)</u> Psychoeducation on how stigma may lead to/maintain negative symptoms; strategies such as educating others about mental illness

TABLE 2 Wilcoxon signed rank for completers at pre-analysis, post-analysis and follow-up analysis

Variable	Median Pre	Median Post	Z	P	r	Median Follow-up	Z	P	r
Anhedonia	3.5	3.0 (N = 10)	-1.21 ^a	.228	-0.27	3.0 (N = 5)	-1.6	0.102	-0.50
Lack of normal distress	1.0	0.0 (N = 10)	-1.48 ^a	.140	-0.33	0.0 (N = 5)	-1.46	0.144	-0.46
Asociality	4.5	1.5 (N = 10)	-2.32 ^a	.021*	-0.52	3.0 (N = 5)	-2.02	0.043*	-0.64
Avolition	4.5	3.50 (N = 10)	-1.08	.280	-0.24	1.0 (N = 5)	-1.84	0.066	-0.58
Blunted affect	7.0	3.0 (N = 10)	-2.69	.007*	-0.60	0.0 (N = 5)	-2.03	0.042*	-0.64
Algia	2.0	3.0 (N = 10)	-.85	.395	-0.19	0.0 (N = 5)	-1.3	0.180	-0.41

^aBased on positive ranks.

* $p < .05$.

3 | RESULTS

A total of 10 out of 15 participants completed all eight sessions and were therefore included in the pre and post analysis, with 5 patients available at follow-up. Scores for each BNSS item at baseline, post-intervention and follow-up can be found in Table 2. A statistically significant decrease on items of sociality and blunted affect was found over the course of the intervention with large effect sizes at post intervention and at follow-up. No significant changes were found on anhedonia, distress, avolition or algia though numerical improvements were seen on all the dimensions.

4 | DISCUSSION

In the present follow-up analysis, it was found that a modified version of MCT targeting negative symptoms led to significant improvements

on two out of five items of BNSS: asociality and blunted affect. The findings add additional support to the five-factor model where each dimension should be analysed independently in future trials.

The improvements on social behaviour seen on BNSS might be due to the fact that the intervention specifically targeted beliefs concerning asociality and defeatist beliefs in social contexts in line with the cognitive model. Based on the conceptualisation of negative symptoms as demotivational and asocial beliefs arising due to setbacks in social contexts, the various (meta)cognitive and behavioural elements of MCT for negative symptoms (e.g., strategies around interpreting social cues, psychoeducation around the benefits of being close to others, homework tasks explicitly instructing the individual to engage in social interactions) may have allowed individuals to test their dysfunctional assumptions and develop new types of behavioural patterns and experiences, which in turn might have led to less isolation and positive experiences of being in a social context. This would be in line with previous research as ostracism (i.e., being

socially excluded and ignored) has been found to predict negative symptoms as well as to be increased by negative symptoms (Jaya et al., 2022). A change in social behaviour driven by metacognitive processes was also reported in the qualitative feedback in the original article (Swanson et al., 2021) (e.g., 'I learned that I can actually do things together with other people, it is all in my head, that I need to do things just on my own ...' [P4] and 'I am trying a bit harder to socialise ... It's helping with my social confidence. That makes me feel good' [P5]).

It may be hypothesized that the improvements on blunted affect was due to specific improvements in self-reflectivity, a core domain of metacognition, as this have been suggested to be uniquely linked to diminished expression as it enables the individual to identify and express a specific emotion and understand why and how the emotion has emerged. Accordingly, without this ability, others will be left unable to detect emotion, which would result in a high score on blunted affect. Self-reflectivity has shown to predict concurrent and prospective negative symptoms and mediate the relationship between cognitive symptoms and diminished expression in previous research (García-Mieres et al., 2020).

Of the non-significant improvements in other dimensions, least change was seen on anhedonia when analysing the scores pre and post (median of 3.5 at baseline compared to 3.0 at post/follow-up). This may be seen as surprising as the intervention contains psychoeducation around the difference between consummatory anhedonia (i.e. reductions in pleasure arising from ongoing activities) and anticipatory anhedonia (i.e. reductions in anticipation of future) and associated strategies for this (e.g., keeping a 'joy' record with enjoyable memories that was recorded shortly after the experience). This result might suggest that the MCT is not very effective in targeting this ability or that anhedonia in itself is more difficult to treat, which could be reflected in the observation that this symptom domain has been associated with a worse prognosis than symptoms related to, e.g., blunted affect (Favrod et al., 2019). Another explanation might be that anticipating future experience seems to be dependent on episodic memory (which is known to be impaired in schizophrenia) (Jarratt-Barnham et al., 2020) or that changes in anhedonia was hard to detect with BNSS due to its subjective nature, where a self-rated measurement (e.g., the Self-Evaluation of Negative Symptoms (SNS); Dollfus et al., 2016) might have been more sensitive in detecting potential changes as they better assess subjective feelings (Dollfus et al., 2022). It is possible that also changes in avolition would have been better detected with a self-rated measurement as this is partly dependent on internal experience on the BNSS. Yet another possibility could be that the majority of participants were recruited from in-patient care where the opportunities for social interactions were better (e.g., talking with other inpatients and key workers) than for taking part in meaningful activities (e.g., vocational training or recreational hobbies). The lack of changes on alogia is in line with other research as self-defeatist has been found to be highly related to affective flattening, avolition and apathy but not to alogia in a recent study on the effect of mindfulness on negative symptoms (Lee & Yu, 2021).

4.1 | Strengths and limitations

It should be acknowledged that the study had several limitations. Although the chosen tool for the main outcome measurement represents best practice in the assessment of negative symptoms, it would have been preferable if an independent researcher had performed the assessment. As mentioned in the original study (Swanson et al., 2021), we cannot conclude that change over time occurred as a result of MCT as there was no control and all participants received treatment as usual during the intervention. The study is also limited in regards to its small sample size which means that the risk of Types I and II error should be acknowledged. Moreover, it cannot be excluded that improvements were not due to the intervention in itself but rather due to the experience of receiving psychotherapy where the interaction with the therapist might have provided a corrective experience for previous abusive relationships (hence explaining the improvements on sociality) and a therapeutic space that facilitated metacognitive processes in terms of the understanding oneself and others that led to more emotional engagement (hence explaining the improvements on blunted affect). This would be in line with a recent meta-analysis where a strong therapeutic alliance was associated with improvements on negative symptoms (Browne et al., 2021).

An important strength of the study was the case series design which made the evaluation of the intervention in 'real world' circumstances possible with clients that are often perceived as unable to change. Although the results are preliminary, the study has clear clinical implications in that it informs future studies on interventions for negative symptoms.

5 | CONCLUSION

The study provides preliminary evidence that an adapted version of MCT improves specific aspects of negative symptoms, namely, asociality and blunted affect. The results motivate further evaluation in larger samples, utilizing a more robust randomized controlled design by including a control group as well as independent assessors. We hypothesize that improvements are driven by increases in reflective capacity or broader metacognitive processes. The question of underlying mechanisms may be addressed by employing resting-state functional magnetic resonance imaging to investigate if MCT for negative symptoms has an impact on areas involved in metacognition as found previously (Shan et al., 2020).

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