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An open clinical trial assessing a novel training program for social cognitive impairment in schizophrenia

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Abstract

Introduction: Social cognition is profoundly impaired in schizophrenia. This study describes ‘Mental-State Reasoning Training for Social Cognitive Impairment’ (SoCog-MSRT), a five-week program developed to improve social cognition in schizophrenia. Our aim was to investigate the feasibility of implementing SoCog-MSRT in a rehabilitation setting, and to evaluate whether training produced improvements. Method: The feasibility and benefits of SoCog-MSRT were evaluated in an open clinical trial with 14 participants with schizophrenia or schizoaffective disorder. Training comprised 10 twice weekly sessions for five weeks with pre- and post-training assessment. Results: There were significant improvements on: 1) a classic false-belief test of Theory of Mind (ToM); 2) to infer complex mental states from the eyes; and 3) a self-reported measure of social understanding. Some of these improvements were associated with baseline levels of working memory and premorbid IQ. Conclusions: SoCog-MSRT can improve ToM abilities and social understanding but individuals with poorer working memory and lower premorbid IQ may be less able to benefit from training.

Keywords: Remediation, Theory of Mind, mental-state reasoning, emotion recognition, attributional bias, schizophrenia
Social cognition refers to the ways in which people understand the actions, intentions and thoughts of others. It is impaired in schizophrenia, especially in the domains of emotion perception, ‘Theory of Mind’ (ToM) and attribution style 1.

Impaired social cognition contributes significantly to the impact of schizophrenia, with over 60% of people with schizophrenia unable to fulfil social roles such as parenting or work, and 83.7% being unemployed due to poor social functioning 2. These factors frequently lead to increased isolation and social disability 3. Impaired social cognition does not improve to any clinically significant extent with current pharmacological treatments for schizophrenia 4, 5; thus, there has been an intense focus on developing evidence-based psychosocial programs to treat these deficits. Our aim was to test the feasibility and implementation of a new program, ‘Mental-State Reasoning Training for Social Cognitive Impairment’ (SoCog- MSRT), developed to improve mental state reasoning in schizophrenia.

Treatment Development

Despite growing evidence that social cognition can be generally improved using various psychosocial approaches, it remains unclear which aspects of broad-based training programs produce which improvements. It is widely accepted that emotion perception, ToM, and attribution style are all associated with real-world functioning 1; however, a recent meta-analysis 6 showed that the relationship between ToM and functional outcomes (effect size = 0.48) was more than twice as strong as the relationship between emotion perception and outcomes (effect size = 0.22). Thus, Fett and colleagues charged future research with investigating whether treating specific domains of social cognition (e.g., ToM) can best improve functional outcomes. Towards this end, we have already piloted a targeted Emotion Recognition Training program with promising results.
The aim of this current study was to test another social cognitive remediation program (SoCog-MSRT) that targets ToM and attribution style with no specific reference to emotion recognition. We focused on these two subdomains because biases in attributional style are thought to interact with ToM impairments, particularly when situations are ambiguous, thus exacerbating other-blaming, especially in people with paranoia 7, 8. Hence, the challenge in SoCog-MSRT was to encourage cognitive flexibility about others’ likely thoughts, tolerance of ambiguity, and thoughtful consideration of others’ perspectives within the social context. SoCog-MSRT addresses these challenges by using a suite of games and activities to improve participants’ capacities to move beyond immediate assumptions to put themselves metaphorically into the “others’ mental shoes” and thus engage in perspective taking.

To test the efficacy of SoCog-MSRT, we use a stage-model approach 9. This Stage 1 study presents the preliminary evaluation of feasibility and efficacy in an open clinical trial in a rehabilitation service in Sydney, Australia. Specifically we predicted that SoCog-MSRT would produce improvements on: (1) the Reading the Mind in the Eyes Test (RMET), which assesses ability to attribute complex mental states (e.g., thoughtful, regretful, compassionate) from viewing another person’s eyes 10; (2) the Hinting Task which tests ability to infer the intended meaning of speakers who use indirect hints 11; and (3) a non-verbal picture sequencing test of ability to reason that others can act on the basis of false beliefs 10, 12, 13. We also expected: (4) a decrease in the tendency to blame others for negative outcomes; and (5) improvement in self-reported use of social skills and the instinctive understanding of social situations (e.g., “I find it hard to know what to do in a social situation”) using the short form of the Empathy Quotient 14. We also wanted to show that the program was targeted, so expected no improvement in emotion recognition, which was not explicitly trained.

**Method**
Participants

Seventeen participants diagnosed with schizophrenia or schizoaffective disorder entered the study; fourteen (schizophrenia=9/schizoaffective=5) completed the full training/testing protocol (12 males/2 females; 8 inpatients/6 outpatients). Of the three males who dropped out, one worked and found the training schedule not feasible; the other two were inpatients who experienced an acute exacerbation of their symptoms. All participants were proficient in English and able to give informed consent. Exclusion criteria included learning difficulties, bipolar disorder, comorbid neurological illness, history of head injury (unconscious > one hour), current substance/alcohol abuse, or electroconvulsive therapy.

Referrals were via clinicians within the Rehabilitation Services of the Western Sydney Local Health District (WSLHD). Diagnoses were confirmed by referring clinicians and medical notes. Written informed consent was obtained and witnessed by an independent hospital staff member who ensured that the participants understood what was required. The study was approved by the WSLHD Human Research Ethics Committee (no. HREC2006/10/4.8[2446]).

Materials

Current symptoms were assessed (over the preceding 4 weeks) at baseline only using the Scales for Assessment of Positive 15 and Negative Symptoms 16 with clinical state closely monitored over the training period. Participants were also asked to complete a range of neurocognitive and social cognition measures at baseline (Time 1; T1) and post-training (Time 2; T2) as described below.

Baseline neuropsychological assessments included National Adult Reading Test to assess premorbid IQ 9 and Digits forwards and backwards from the Wechsler Adult Intelligence Scale 17 to test working memory.
Five measures of social cognition were assessed at T1 and T2. Recognition of basic facial emotion cues (happy, sad, angry, surprised, fearful, disgusted, neutral) was tested using both 100% and 75% morphed intensity expressions to increase task sensitivity. Participants were shown the facial expressions and had to choose the label (displayed below the expression) that best described the expression.

The Reading the Mind in the Eyes Test (RMET; 10) was used to assess ability to attribute complex mental states by viewing the eye regions of a face. The Hinting Task was used to assess ability to infer intentions behind indirect speech (11). Ability to reason in terms of false beliefs was assessed using the False-Belief Picture Sequencing Test (FBPST) (12, 13). Two sets of stories from the FBPST were used; False Belief (PST-FB) stories and Mechanical Control stories (PST-MC) that test non-social physical cause and effect reasoning.

Attributional style was assessed using the Internal, Personal and Situational Attributions Questionnaire (IPSAQ; 18). Two bias scores are produced from the IPSAQ; an externalising bias indexing avoiding blame for negative events; and a personalising bias indexing the tendency to blame others rather than circumstances when externalising blame (18).

The short form of the Empathy Quotient (EQ) was used as a self-report measure of cognitive empathy (cognitive understanding of another’s mental states), social skills (intuitive understanding of social situations and spontaneous use of social skills), and emotional reactivity (affective empathy, i.e., emotional response to others’ feelings). The EQ is scored on a 4-point Likert-type scale as 0 (strongly disagree), 1 (disagree), 2 (agree), and 3 (strongly agree). After reverse scoring, where required, subscale scores were computed as totals.

After training, we also invited participants to rate their enjoyment of the program, how difficult they found it, whether they felt it had benefited them, and whether they felt their
social skills had improved. Enjoyment, difficulty, benefit and improvement were rated on a five-point Likert scale (1= ‘a little’, 2= ‘occasionally’, 3= ‘somewhat’, 4= ‘mostly’, 5= ‘a lot’).

**SoCog-MSRT training**

SoCog-MSRT comprises 10 twice-weekly one-hour sessions for 5 weeks. Training was conducted in groups of 3-6 people using a manual-driven suite of activities including games (e.g., Social Trivia) and short films (Tropfest Videos\(^1\)) with prompts to highlight the different film characters’ mental perspectives. All activities centred on vignettes of social situations with a focus on making inferences and predictions about different characters’ thoughts, feelings, and behaviours. Similar vignettes are repeated across different activities with frequent repetition of training material and concepts.

We designed SoCog-MSRT to be engaging and social in nature to motivate participants to return for each session. Sessions are structured to give participants a sense of control over training and to enhance engagement with the treatment 19; thus, facilitators set the activity for the first 20 minutes of a session and then the participants choose an activity for the second 20 minutes with a 10-minute break between the activities. A points system and prizes were used to provide extrinsic motivation, recognised as a valuable tool to use during remediation programs with people with schizophrenia 20.

**Results**

Table 1 shows demographic, cognitive, and clinical information. Attendance was very good (mean attendance=96.43%).

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\(^1\) Obtained and used with permission from Tropfest Australia ([http://www.tropfest.com](http://www.tropfest.com)).
Dependent variables were assessed for normality and scores for four participants on four variables\(^2\) were identified as outliers and replaced with the next most extreme score +/- one. To address the study hypotheses we conducted planned paired-samples t-tests. The distribution of PST-MC scores was skewed due to ceiling effects; however, a nonparametric analysis produced the same results as a parametric analysis, so we report parametric results throughout.

As predicted there was no change in emotion recognition, which was not targeted by training (\(p=.20\)). In contrast, there were significant increases from T1 to T2 for the social cognition measures of PST-FB (\(t_{13}=2.27, p=.045, d=.533\)), RMET (\(t_{13}=3.375, p=.005, d=.9377\)), and one of the EQ subscales: social skills (\(t_{13}=2.308, p=.038, d=.6166\), but not the other two: cognitive empathy (\(p=.861\)) or emotional reactivity (\(p=.336\)). There was no significant improvement on the Hinting Task (\(p=.292\)) with participants already close to ceiling at T1 (mean=17.4/20). Unexpectedly, there was also a significant improvement for the non-social PST-MC control stories consistency (\(t_{13}=2.844, p=.014, d= -0.7347\)).

To illustrate change, we calculated proportion change indices\(^3\) (PCIs) from baseline to post-training for each social cognitive variable, with the exception of the attributional bias scores which we discuss separately below. See Figure 1. A positive PCI represents improvement after training.

\[^{2}\] These were: Hinting (T2), EQ-emotional reactivity subscale (T2), PST-MC (T2), emotion recognition accuracy (T2)

\[^{3}\] PCI= \([\text{Post-score (T2)} - \text{Pre-score (T1)}]/\text{Pre-score (T1)}\) for each variable of interest.
Results for the IPSAQ showed that the T1 personalising bias score (M=.61, SD=.24) was not significantly different from .5, indicating that this sample did not show a bias to personalise blame. This did not change significantly following training (M=.65, SD=.17). There was also no significant change in externalising bias scores from T1 (M=-.71, SD=1.64) to T2 (M=.21, SD=3.17), which were close to zero at both times.

There were significant correlations between improved social cognition (indexed by T2-T1 scores) and baseline neurocognitive scores. Improvements on the PST-FB were strongly associated with baseline working memory (r_{14}=.681, p=.007) and IQ (r_{14}=.599, p=.024), whilst improvement on the PST-MC was associated only with premorbid IQ (r_{14}=-.751, p=.002). There was also a strong association between improvement on the RMET and improvement of social skills (r_{14}=.555, p=.039).

Ten participants provided feedback on the program. SoCog-MSRT was well accepted by participants as indicated by their ratings of enjoyment, benefit, and difficulty. Nine reported their social skills had improved, all felt it had benefited them to some extent ranging from ‘occasionally’ (n=2), ‘mostly’ (n=2), ‘somewhat’ (n=3) and ‘a lot’ (n=3). Five found the program ‘occasionally’ difficult, three ‘a little’ difficult whilst one rated the training as ‘mostly’ and one as ‘somewhat’ difficult. Five participants reported that they mostly enjoyed training, two ‘somewhat’, and two ‘a little’.

**Discussion**

The aim of this study was to assess the feasibility of our new SoCog-MSRT program. SoCog-MSRT was well accepted by participants, and they showed significant improvements in abilities to infer complex mental states from the eyes, reason causally about false beliefs, and intuitively understand social situations (EQ Social Skills subscale). The latter is particularly
encouraging as this indicates that participants themselves are reporting an increased understanding of social situations and use of social skills after SoCog-MSRT.

Improvements on some measures (e.g. PST-FB) were positively associated with baseline working memory and premorbid IQ indicating that poorer working memory and lower IQ may impact negatively on ability to benefit from training; so some individuals may need basic training to improve neurocognitive functioning before they can fully benefit from social-cognitive training.

We also found an unexpected improvement on a control measure of cause-and-effect reasoning. Whilst this may be a practice effect, an earlier study to test efficacy of cognitive behavioural therapy in delusional individuals found no practice effect on this measure 21. So, it may be that our training, which focused on understanding how behaviour A might result in outcome B or C in social situations, actually improved general cause-and-effect reasoning.

While these results are promising, interpretations must be tempered by the small sample size and the limitations of an open clinical trial. So, we are now moving on to a Stage 2 randomised single-blind control study to evaluate SoCog-MSRT compared to a wait-list control and targeted emotion recognition training; here we will also assess the generalisation of training to everyday social functioning.
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References


Disclosures

The Author(s) declare(s) that there is no conflict of interest.

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Table 1: Means (SD) for demographic, clinical, and cognitive variables at baseline

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>29.86 (10.44)</td>
</tr>
<tr>
<td>Years Formal Ed</td>
<td>10.93 (1.141)</td>
</tr>
<tr>
<td>Age Onset</td>
<td>16.92 (3.315)</td>
</tr>
<tr>
<td>No. episodes</td>
<td>2.5 (1.168)</td>
</tr>
<tr>
<td>NART IQ Equiv.</td>
<td>104.57 (9.967)</td>
</tr>
<tr>
<td>WAIS Digits</td>
<td>8.86 (2.107)</td>
</tr>
<tr>
<td>CPZ</td>
<td>245 (295.26)</td>
</tr>
<tr>
<td>Total positive symptoms(^a)</td>
<td>7.1429 (3.25475)</td>
</tr>
<tr>
<td>Total negative symptoms(^b)</td>
<td>13.5714 (2.50275)</td>
</tr>
</tbody>
</table>

\(^a\) Sum of global positive ratings; \(^b\) Sum of global negative ratings
Figure 1: Proportion Change Indices (PCIs) for improvements on social cognitive assessment tests