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

Pamela Marsh, Robyn Langdon, Jonathan McGuire, Anthony Harris, Vince Polito and Max Coltheart

Australas Psychiatry published online 14 February 2013
DOI: 10.1177/1039856213475683

AP

Australasian Psychiatry
0(0) 1–5

DOI: 10.1177/1039856213475683
apy.sagepub.com
SAGE

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

Pamela Marsh Postdoctoral Research Fellow, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney, NSW, Australia

Robyn Langdon Associate Professor, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney, NSW, Australia

Jonathan McGuire PhD Candidate, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney, NSW, Australia

Anthony Harris Associate Professor, Discipline of Psychiatry, University of Sydney, and Brain Dynamics Centre, Westmead Millennium Institute, University of Sydney, Westmead, NSW, Australia

Vince Polito PhD Candidate, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney, NSW, Australia

Max Coltheart Emeritus Professor of Cognitive Science, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney, NSW, Australia

Abstract

Objective: Social cognition is profoundly impaired in patients with schizophrenia. This study describes 'Mental-State Reasoning Training for Social Cognitive Impairment' (SoCog-MSRT), a 5-week program developed to improve social cognition in patients with schizophrenia. We aimed to investigate the feasibility of implementing SoCog-MSRT in a rehabilitation setting and to evaluate whether our training methods 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 5 weeks, with a pre- and post-training assessment.

Results: There were significant improvements on: (a) a classic false-belief test of Theory of Mind (ToM); (b) inferring complex mental states from the eyes; and (c) a self-reported measure of social understanding. Some of these improvements were associated with baseline levels of working memory and premorbid Intelligence Quotient (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 this type of training.

Keywords: attributional bias, emotion recognition, mental-state reasoning, remediation, schizophrenia, socialisation, social cognitive impairment, Theory of Mind, training program

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 being unable to fulfil social roles, such as parenting or working, and 83.7% of them being unemployed, due to poor social functioning.[2] These factors frequently lead to increased isolation and social dis-

Correspondence:
Pamela Marsh, ARC Centre of Excellence in Cognition and its Disorders (CCD), Macquarie University, Sydney NSW 2109, Australia.
Email: pamela.marsh@mq.edu.au

ability.[3] Impaired social cognition does not improve to any clinically significant extent with usage of the 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 aims were first to test the feasibility and then the 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 the 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 functional outcomes (effect size = 0.22). Thus, Fett and colleagues[6] charged future research with investigating whether treatment of specific domains of social cognition such as ToM can best improve functional outcomes. Towards this end, we have already piloted a targeted Emotion Recognition Training program, obtaining promising results.[7,8]

The aim of this current study was to test another social cognitive remediation program called SoCog-MSRT, which targets ToM and attribution style, with no specific reference to emotion recognition. We focused on these two subdomains because biases in attribution style are thought to interact with ToM impairment, particularly when situations are ambiguous, thus exacerbating other-blaming, especially in people with paranoia.[9,10] Hence, the challenge in applying 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 the participants' capacities to move beyond their 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 planned to use a stage-model approach.[11] This Stage 1 study presents the preliminary evaluation of feasibility and efficacy in an open clinical trial at a rehabilitation service in Sydney, Australia. Specifically, we predicted that SoCog-MSRT would produce improvements in:

1. The Reading the Mind in the Eyes Test (RMET), which assesses the ability to attribute complex mental states (e.g. thoughtful, regretful, compassionate) from the viewing of another person's eyes;[12]
2. the Hinting Task, which tests for the ability to infer the intended meaning of speakers who use indirect hints;[13]
3. a non-verbal picture sequencing test of the ability to reason that others can act on the basis of false beliefs.[12,14,15]

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.[16]

We also wanted to show that the program was targeted, so we expected no improvement in emotion recognition, as it was not explicitly trained.

Methods

Participants

We entered 17 participants diagnosed with schizophrenia or schizoaffective disorder into the study; 14 (schizophrenia = 9; schizoaffective disorder = 5) completed the full training/testing protocol (12 males; 2 females: 8 inpatients; 6 outpatients). Of the three males who dropped out, one who worked found the training schedule not feasible; the other two were inpatients who experienced an acute exacerbation of their symptoms. All our study 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 (unconsciousness > 1 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 (number HREC2006/10/4.8[2446]).

Materials

Current symptoms (over the preceding 4 weeks) were assessed at baseline only, using the Scales for Assessment of Positive[17] and Negative Symptoms,[18] with the participants' clinical state closely monitored over the training period. Participants were also asked to complete a range of neurocognitive and social cognitive measures at baseline (T1 = Time 1) and post-training (T2 = Time 2), as described below.

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

Variable	*Mean (SD)*
Age	29.86 (10.44)
Years of Formal Education	10.93 (1.141)
Age Onset	16.92 (3.315)
Number of Episodes	2.5 (1.168)
NART IQ Equiv.	104.57 (9.967)
WAIS Digits	8.86 (2.107)
CPZ	245 (295.26)
Total positive symptoms[a]	7.1429 (3.25475)
Total negative symptoms[b]	13.5714 (2.50275)

[a]Sum of global positive ratings.

[b]Sum of global negative ratings.

CPZ: Chlorpromazine equivalents?; IQ: intelligence quotient, a measure of intelligence; NART: National Adult Reading Test?; WAIS: Wechsler Adult Intelligence Scale?

Baseline neuropsychological assessments included the National Adult Reading Test[11] to assess premorbid Intelligence Quotient (IQ) and the Digits forwards and backwards from the Wechsler Adult Intelligence Scale[19] to test for 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)[12] was used to assess the ability to attribute complex mental states by viewing the eye regions of a face. The Hinting Task was used to assess the ability to infer intentions behind indirect speech.[13] Ability to reason in terms of false beliefs was assessed using the False-Belief Picture Sequencing Test (FBPST).[14,15] Two sets of stories from the FBPST were used, Picture Sequencing Test for False Belief (PST-FB) stories and Picture Sequencing Test for Mechanical Control (PST-MC) stories, which test non-social physical cause-and-effect reasoning. Attributional style was assessed using the Internal, Personal and Situational Attributions Questionnaire (IPSAQ).[20] 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.[20]

The short form of the Empathy Quotient (EQ) was used as a self-reporting 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., the emotional response to others' feelings). The EQ was scored on a 4-point Likert-type scale (0 = strongly disagree, 1 = disagree, 2 = agree, 3 = strongly agree). After reverse scoring, where required, the subscale scores were computed for the totals.

After training, we also invited the 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 5-point Likert scale (1 = a little, 2 = occasionally, 3 = somewhat, 4 = mostly, 5 = a lot).

SoCog-MSRT training

SoCog-MSRT comprised 10 twice-weekly 1-hour sessions, for 5 weeks. Training was conducted in groups of 3–6 people, using a manually-driven suite of activities including games (e.g. social trivia) and short films (Tropfest Videos, obtained and used with permission from 'Tropfest Australia') 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 the participants to return for each session. Sessions were structured to give participants a sense of control over training and to enhance engagement with the treatment;[21] thus, facilitators set the activity for the first 20 minutes of a session and then the participants chose an activity for the second 20 minutes, with a 10-minute break between the activities. A point-accrual system and prizes were used to provide extrinsic motivation, recognised as a valuable tool to use during remediation programs with people with schizophrenia.[22]

Results

Table 1 shows the demographic, cognitive and clinical information of study participants. Attendance was very good, with a mean attendance of 96.43%.

Dependent variables were assessed for normality, and the scores for four participants on four variables were identified as outliers and then replaced with the next most extreme score +/- one (These were Hinting (T2), EQ-emotional reactivity subscale (T2), PST-MC (T2), emotion recognition accuracy (T2)). To address the study hypotheses, we conducted planned paired-sample *t*-tests. The distribution of PST-MC scores was skewed due to ceiling effects; however, a nonparametric analysis pro-

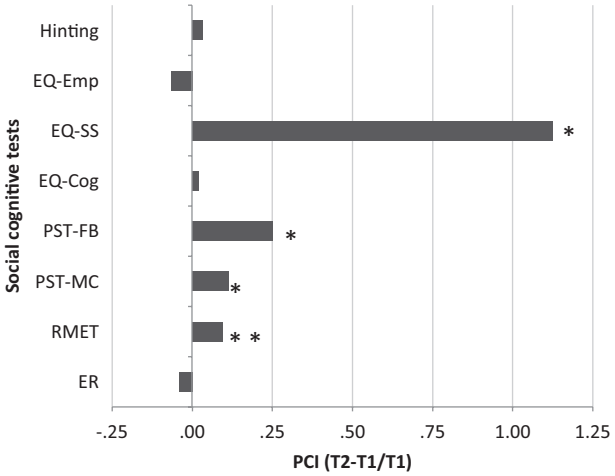

Figure 1. PCIs for improvements on social cognitive assessment tests.

EQ-Cog: Empathy Quotient test for social cognition; EQ-Emp: Empathy Quotient test for Affective Empathy; EQ-SS: Empathy Quotient test for social skills; ER: emotion recognition; PCI: proportion change indices; PST-FB: Picture Sequencing Test for False Belief; PST-MC: Picture Sequencing Test for Mechanical Control; RMET: Reading the Mind in the Eyes Test; T1: measure at pre-training time; T2: measure at post-training time

* p,.05; ** p<.01

duced the same results as a parametric analysis, so we report our parametric results throughout.

As predicted, there was no change in emotion recognition, which was not targeted by our training program (p = 0.20). In contrast, there were significant increases from T1 to T2 for the social cognition measures of PST-FB (t_{13} = 2.27; p = 0.045; d = 0.533), RMET (t_{13} = 3.375; p = 0.005; d = 0.9377), and one of the EQ subscales, social skills (t_{13} = 2.308; p = 0.038; d = 0.6166), but not the other two: cognitive empathy (p = 0.861) and emotional reactivity (p = 0.336). There was no significant improvement on the Hinting Task (p = 0.292), with participants already close to the ceiling at T1 (mean = 17.4/20). Unexpectedly, there was also a significant improvement in the non-social PST-MC control stories consistency (t_{13} = 2.844; p = 0.014; d = -0.7347).

To illustrate change, we calculated proportion change indices (PCIs) from baseline to post-training for each social cognitive variable, with the exception of the attributional bias scores, which we discuss separately below. The equation we used for each variable of interest follows (equation (1)):

$$\text{PCI} = \frac{[\text{Post-score (T2)} - \text{Pre-score (T1)}]}{\text{Pre-score (T1)}} \quad (1)$$

A positive PCI represents improvement after training (see Figure 1).

Results for the IPSAQ showed that the T1 personalising bias score (M = 0.61 (SD = 0.24)) was not significantly different from 0.5, indicating that this sample did not show a bias to personalise blame. This did not change significantly following training (M = 0.65 (SD = 0.17)). Also, there was no significant change in the externalising bias scores from T1 (M = -0.71 (SD = 1.64)) to T2 (M = 0.21 (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 the baseline neurocognitive scores. Improvements on the PST-FB were strongly associated with the baseline for working memory (r_{14} = .681; p = 0.007) and premorbid IQ (r_{14} = 0.599; p = 0.024), whilst improvement on the PST-MC was associated only with premorbid IQ (r_{14} = –0.751; p = 0.002). There was also a strong association between improvement on the RMET and improvement of social skills (r_{14} = 0.555; p = 0.039).

Feedback on the program was provided by 10 participants. SoCog-MSRT was well accepted by participants, as indicated by their ratings of enjoyment, benefit and difficulty. Nine participants reported that their social skills had improved; all felt the program had benefited them to some extent, ranging from 'occasionally' (n = 2) to 'mostly' (n = 2), 'somewhat' (n = 3) and 'a lot' (n = 3). Five participants found the program was 'occasionally' difficult and three 'a little' difficult, whilst one rated the training as 'mostly' difficult and one as 'somewhat' difficult. Five participants reported that they 'mostly' enjoyed the 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 the study participants. They showed significant improvements in their abilities to infer complex mental states from viewing the eyes, to reason causally about false beliefs, and to 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 their new social skills after SoCog-MSRT.

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

We also found an unexpected improvement in a control measure of cause-and-effect reasoning. Whilst this may be a practice effect, an earlier study to test the efficacy of cognitive behavioural therapy in delusional individuals

found no practice effect on this measure.[23] 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 the participants' general cause-and-effect reasoning.

While these results are promising, any interpretations of results must be tempered by the small sample size and the limitations of an open clinical trial. Thus, we are now moving on to a Stage 2 randomised single-blind control study to further evaluate SoCog-MSRT, as compared to a wait-list control group and targeted emotion recognition training. We will also assess whether training produces improvements in everyday social functioning.

Funding

This work was supported by a Macquarie University Safety Net Grant (grant number 9200729292) and by the ARC Centre of Excellence in Cognitive Disorders (CCD 3-year Postdoctoral Fellowship).

Acknowledgements

We gratefully acknowledge the contribution of participants who gave so generously of their time. We thank the staff at Cumberland and Macquarie Hospitals for their assistance. We also thank Anoushka Somasunderam and Simon Wu for assisting with data entry.

Disclosure

The authors report no conflict of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Horan WP, Kern RS, Penn DL, et al. Social cognition training for individuals with schizophrenia: Emerging evidence. *Am J Psychiatric Rehabil* 2008; 11: 205–252.
2. Waghorn G, Chant D, White P, et al. Delineating disability, labour force participation and employment restrictions among persons with psychosis. *Acta Psychiatrica Scand* 2004;109: 279–288.
3. Bellack AS, Mueser KT, Gingerich S, et al. *Social skills training for schizophrenia: A step-by-step guide.* 2nd ed. New York: The Guilford Press, 2004, p.340.
4. Green MF, Penn DL, Bentall R, et al. Social cognition in schizophrenia: An NIMH workshop on definitions, assessment, and research opportunities. *Schizophrenia Bull* 2008: vol 34:p 1211–1220.
5. Roberts DL, Penn DL, Corrigan P, et al. Antipsychotic medication and social cue recognition in chronic schizophrenia. *Psychiatry Res* 2010; 178: 46–50.
6. Fett AJ, Viechtbauer W, Dominguez MG, et al. The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis. *Neurosci Biobehav Rev* 2011; 35: 573–588.
7. Marsh PJ, Green MJ, Russell T, et al. (2010) Remediation of facial emotion recognition in schizophrenia: Functional predictors, generalisability, and durability. *American Journal of Psychiatric Rehabilitation* 13: 143–170.
8. Marsh PJ, Luckett G, Russell T, et al. (2012) Effects of facial emotion recognition remediation on visual scanning of novel face stimuli. *Schizophrenia Research* 141: 234–240.
9. Harvey PD and Penn D. Social cognition: The key factor predicting social outcome in people with schizophrenia? *Psychiatry* 2010; 7: 41–44.
10. Penn DL, Roberts DL, Combs D, et al. The development of the Social Cognition and Interaction Training program for schizophrenia spectrum disorders. *Psychiatric Services* 2007; 58: 449–451.
11. Nelson HE and Willison J. *National Adult Reading Test.* 2nd ed. Windsor, UK: NFER-Nelson, 1991.
12. Baron-Cohen S, Wheelwright S, Hill J, et al. The "Reading the Mind in the Eyes" Test revised version: A study with normal adults, and adults with Asperger syndrome or high-functioning autism. *J Child Psychol Psychiatry* 2001; Vol 42: 241–251.
13. Corcoran R, Mercer G and Frith CD. Schizophrenia, symptomatology and social influence: Investigating "theory of mind" in people with schizophrenia. *Schizophrenia Res* 1995; 17: 5–13.
14. Langdon R and Coltheart M. Mentalising, schizotypy, and schizophrenia. *Cognition* 1999; 71:43–71.
15. Harrington L, Langdon R, Siegert RJ, et al. Schizophrenia, theory of mind, and persecutory delusions. *Cognitive Neuropsychiatry* 2005; 10: 87–104.
16. Lawrence E, Shaw P, Baker D, et al. Measuring empathy: Reliability and validity of the Empathy Quotient. *Psychological Med* 2004; 34: 911–919.
17. Andreasen NC. *The Scale for the Assessment of Positive Symptoms (SAPS).* Iowa City: The University of Iowa, 1984.
18. Andreasen NC. *The Scale for the Assessment of Negative Symptoms (SANS).* Iowa City: The University of Iowa, 1984.
19. Wechsler D. *Wechsler Adult Intelligence Scale.* 3rd ed. San Antonio, TX: The Psychological Corp, 1997.
20. Kinderman P and Bentall RP. Causal attributions in paranoia and depression: Internal, personal, and situational attributions for negative events. *J Abnormal Psychology* 1997; 106: 341–345.
21. Choi J and Medalia A. Intrinsic motivation and learning in a schizophrenia spectrum sample. *Schizophrenia Res* 2010; 118: 12–19.
22. Silverstein SM, Spaulding WD, Menditto AA, et al. Attention shaping: A reward-based learning method to enhance skills training outcomes in schizophrenia. *Schizophrenia Bull* 2009; 35: 222–232.
23. Brakoulias V, Langdon R, Sloss G, et al. Delusions and reasoning: A study involving cognitive behavioural therapy. *Cognitive Neuropsychiatry* 2008; 13: 148–165.