# A virtual reality-integrated program for improving social skills in patients with schizophrenia: A pilot study

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## ARTICLE INFO

## ABSTRACT

*Background and objectives:* Social skills training (SST) intervention has shown its efficacy to improve social dysfunction in patients with psychosis; however the implementation of new skills into patients' everyday functioning is difficult to achieve. In this study, we report results from the application of a virtual reality (VR) integrated program as an adjunct technique to a brief social skills intervention for patients with schizophrenia. It was predicted that the intervention would improve social cognition and performance of patients as well as generalisation of the learned responses into patient's daily life.
*Methods:* Twelve patients with schizophrenia or schizoaffective disorder completed the study. They attended sixteen individual one-hour sessions, and outcome assessments were conducted at pre-treatment, post-treatment and four-month follow-up.
*Results:* The results of a series of repeated measures ANOVA revealed significant improvement in negative symptoms, psychopathology, social anxiety and discomfort, avoidance and social functioning. Objective scores obtained through the use of the VR program showed a pattern of learning in emotion perception, assertive behaviours and time spent in a conversation. Most of these gains were maintained at four-month follow-up.
*Limitations:* The reported results are based on a small, uncontrolled pilot study. Although there was an independent rater for the self-reported and informant questionnaires, assessments were not blinded.
*Conclusions:* The results showed that the intervention may be effective for improving social dysfunction. The use of the VR program contributed to the generalisation of new skills into the patient's everyday functioning.

## 1. Introduction

Ameliorating social impairment has become one of the most important challenges when treating patients with schizophrenia (Mueser & McGurk, 2004). In the past, according to the problem-solving framework, this social dysfunction was described as the conjunction of disabilities in social cognition (which refers to the mental operations and capacities that underlie social interactions (Green et al., 2008)) and social competence (which refers to communication skills, e.g., the verbal and nonverbal communication skills that allow successful execution of interpersonal interactions (Dickinson, Bellack, & Gold, 2007)). The social cognition component, appears to be aggravated by the individual's cognitive

deficits (Green, Kern, & Heaton, 2004), affective symptomatology (Lysaker & Salyers, 2007) and difficulties in metacognition (Brüne, Abdel-Hamid, Lehmkämper, & Sonntag, 2007; Chan & Mak, 2012). However, social performance may be environmentally determined by factors such as opportunities, support systems and enhancements (Brekke, 2007). Functional outcomes (or social functioning) are the result of both cognition and performance (Bromley & Brekke, 2010).

Social skills training (SST) interventions (focussing separately on the two above-mentioned components or on both components simultaneously) aim to improve the patient's social functioning and are one of the treatments of choice in schizophrenia spectrum disorders. Most recent clinical trials have explored the ability of this intervention to improve patients' social functioning (Bellack, Mueser, Gingerich, Agresta, 2004; Granholm, Been-Zeev, & Link, 2009; Granholm et al., 2005; Horan et al., 2009, 2011; Roberts & Penn, 2009; Rus-Calafell, Gutiérrez-Maldonado, Ortega-Bravo, Ribas-Sabate, & Caqueo-Urízar, 2013). The SST intervention impacts the social cognition domain, specifically emotion perception

(Horan et al., 2011; Roberts & Penn, 2009), anergia (Horan et al., 2009), independent living skills (Granholm et al., 2005), negative symptomatology and social discomfort (Rus-Calafell et al., 2013). Nonetheless, the improvement and implementation of new social behaviours in the patient's daily life remains difficult to achieve.

Frequently, the SST intervention is applied in a group format, which allows the participants to practise with others, but the intervention can also be delivered in an individual format (Hogarty et al., 1991; Liberman & Eckman, 1989). According to Penn et al. (2004), the number individual psychotherapy approaches for schizophrenia are increasing, particularly those approaches based on cognitive-behavioural models (Garety, Fowler, & Kuipers, 2000). Individual psychotherapy approaches may better target patients' social needs and goals and can place greater emphasis on inter-personal context and the social consequences of symptoms (Tarrier & Calam, 2002). Social anxiety, negative symptoms and poor insight may hamper the involvement of schizophrenia patients in group therapy. Another treatment characteristic of the SST is that it is delivered, like most of the interventions in mental health, in the clinical setting (e.g., consultation, day hospital), which lacks the "real" characteristics of the social situations (e.g., environmental stimulus, sounds or unknown people). Although practitioners formerly included the intervention between session exercises, the evidence supporting the generalisability of psychosocial skills training from the clinical setting to everyday life is far weaker and has received less attention than it deserves (Scott & Dixon, 1995).

For clinicians, observing and practising the patient's social skills in a natural social interaction/environment could prove use, and such practises would facilitate the generalisation of the learned responses into the individual's daily life. However, the naturalistic observation can be time-costly for the clinician and likely highly intimidating for the patient (especially if the clinician must be immersed in the everyday life of the outpatient). Virtual Reality (VR) has emerged as a tool to overcome this limitation of the usual application of the SST intervention. Virtual reality can be defined as technology that integrates real-time computer graphics, sounds and other sensory input to create a computer-generated world with which the user can interact (Gregg & Tarrier, 2007). VR has been shown to be effective in the treatment of mental health problems and psychotherapy delivery (Gregg & Tarrier, 2007; Riva, 2005). The ecological validity of VR remains in the precise presentation and control of dynamic perceptual stimuli, and virtual environments provide valid assessments and situations that combine the veridical control of laboratory measures with the verisimilitude of everyday experiences (Parsons, 2011). Therefore, VR environments can evoke responses in a participant that are very similar to those occurring natural environment. Consequently, a patient's reactions can be evaluated so as to lend stronger credibility to the sense that true data is being produced (Rosqvist et al., 2006). In a meta-analysis by Powers and Emmelkamp (2008), the authors conclude that virtual reality exposure is highly effective in treating specific phobias and other anxiety disorders (including social phobia) in comparison with inactive (control) and active (relaxation) control conditions.

Although it is typically used as an exposure technique for specific phobias, VR has been recently applied with encouraging results to the study and treatment of schizophrenia. Early studies using this technology with psychosis aimed to explore positive symptoms, such as delusions and paranoia, with non-clinical populations (Freeman et al., 2003, 2005) and clinical (Fornells-Ambrojo et al., 2008; Freeman, Pugh, Vorontsova, & Antley, 2010; Valmaggia et al., 2007). In a recent review, Freeman (2008) analysed seven applications of this technology for schizophrenia: symptom assessment, establishment of symptom correlates, identification of predictive variables, investigation of the differential prediction of symptoms, identifying environmental predictors,

tests of putative casual factors and developing treatment. With respect to treatment development, some clinical studies have explored the use of VR for the rehabilitation and psychotherapy of schizophrenia patients: to improve medication management skills (Kurts, Baker, Pearlson, & Astur, 2007), for cognitive remediation therapy (daCosta & Carvalho, 2004) and to improve conversational and communication skills (Ku et al., 2007; Park et al., 2009, 2011). In their 2009 clinical study, Park et al. included a VR program in addition to a social skills training intervention. However, the VE program was a group intervention, and the main purpose was to enhance motivation and enrolment in the group therapy. Furthermore, their sample was composed of inpatients, and it is with outpatient cases and in stability periods that SST and other group-based social interventions are more effective and can assist the individual in correctly implementing and practicing social competence skills. Social skills training intervention using VR has also been applied in patients with autistic spectrum disorders (Mitchell, Parsons, & Leonard, 2007) and has produced encouraging results in reasoning and theory of mind.

We developed a brief social skills intervention for schizophrenia outpatients with social functional impairments (Rus-Calafell et al., 2013). In our previous study, we observed significant improvements in negative symptomatology, social discomfort, social withdrawal and interpersonal communication after treatment, and these benefits were maintained at 6-month post-treatment (Rus-Calafell et al., 2013). However, as mentioned previously, the effect of the intervention on the implementation of new behaviours in the patients' daily life, an increase in pro-social and leisure activities, and skill acquisition was limited. Therefore, we decided to develop a VR program to 1) enable accessibility to those patients who refused to participate in group therapy; and 2) use an ecologically valid tool, the VR system, to train social skills and improve the generalisation of the learned responses in the patients' daily lives. To the best of our knowledge, the present pilot study is the first to integrate a virtual reality program into an individual cognitive-behavioural social skills program intervention. The main hypotheses of the present study were as follows: 1) intervention would result in a reduction in negative symptoms and psychopathology; 2) participants' social skill performance would improve whereas self-reported social discomfort and social anxiety would decrease after the treatment; 3) participants' social functioning in their natural setting would improve after the intervention; 4) participants would exhibit a pattern of learning in the three target behaviours (committed errors in social perception, correct assertive behaviours and time spent in a conversation) practised in VR program.

## 2. Method

### 2.1. Participants

Fifteen patients were enrolled, and twelve completed the study. First, twenty outpatients from the Adult Mental Health Service of Igualada (Catalonia) were contacted and offered the individual social skills training intervention. All of the patients met the DSM-IV-TR (2004) criteria for schizophrenia or schizoaffective disorder and had been clinically diagnosed by their current treating psychiatrist. Of these patients, 15 agreed to participate and were enrolled in the study. The inclusion criteria were as follows: to be between 18 and 55 years old; and to exhibit a deficit in social skills and/or social functioning as indicated by the current clinical psychologist or psychiatrist. There were three exclusion criteria: to have a diagnosis of substance abuse and/or drug consumption; to be already involved in any other intervention for improving social skills (such as group therapy or social-oriented therapy); and to