

Knowledge Notes

Remediation of Cognitive Functioning in Schizophrenia

Danijela Piskulic, PhD

Research Fellow, Psychosis Research Program, Hotchkiss Brain Institute

Background

Impairment in cognition is a core feature of schizophrenia. Individuals with schizophrenia demonstrate deficits across a wide range of cognitive domains compared to healthy persons and even when compared to other psychiatric groups. Furthermore, it is likely these cognitive deficits are there long before the onset of schizophrenia. First, it has been observed that individuals who go on to develop schizophrenia demonstrate more impairment in a range of school functioning compared to those who do not (Jones, Rodgers, Murray, & Marmot, 1994). Secondly, individuals in the early stages of schizophrenia have deficits that are comparable to those seen in persons with chronic schizophrenia (Addington, Saeedi, & Addington, 2006).

Cognitive deficits are strongly related to poor functioning in areas of work, social relationships and independent living (McGurk, Twamley, Sitzler, McHugo, & Mueser, 2007; Green, Kern, Braff, & Mintz, 2000). More specifically, verbal learning, attention, working memory, and reasoning, and problem solving ability are reportedly related to work outcome and behaviour such as hours worked, wages earned and work quality (Kern et al., 2009). Pharmacological treatments that are currently available have limited effect on cognition in schizophrenia (Marder, 2006) and even less effect on functional outcome (Harvey, Green, Keefe, & Velligan, 2004). Although improving cognition in schizophrenia is not an end point in schizophrenia treatment, improving cognition and the ability to learn enables individuals to engage in broader rehabilitation efforts and hence improve their functional outcomes (Green, 2009). As a result, one direction for functional rehabilitation in schizophrenia focuses on improving training methods that take into consideration cognitive deficits of persons with the illness.

This review summarises non-pharmacological research efforts to remediate cognition in schizophrenia and through it, functional outcomes. A literature search was conducted in the electronic databases Pub-Med and MEDLINE for relevant review articles published in peer-reviewed journals using the following keywords: *cognition, schizophrenia, psychosis, remediation, training, rehabilitation, enhancement, review*. Selected articles were reviewed for detailed information regarding cognitive remediation techniques, which is summarised in the following sections.

Cognitive Remediation

A range of cognitive remediation initiatives initially developed for treatment of traumatic brain injury have been adapted for and evaluated in individuals with schizophrenia. These initiatives are divided into cognition-enhancing and compensatory approaches, both of which have been examined in detail in a number of comprehensive reviews of the literature (Velligan, Kern, & Gold, 2006; McGurk et al., 2007; Wykes & Huddy, 2009).

Cognition-enhancing approaches have been designed to improve specific abilities in different cognitive domains (e.g. learning, memory, attention) through a set of specified training interventions (McGurk et al., 2007). These interventions vary according to training requirements, which are summarised in Table 1.

Table 1. Cognition-enhancing training requirements

Training requirements	What is involved?
Type	<ul style="list-style-type: none"> • drill and practice or repetition of learned material to a predetermined level of performance • strategy coaching that includes methods such as chunking of learned information to improve recall and problem solving skills • combination of the two types
Mode of training	<ul style="list-style-type: none"> • paper and pencil • computer-based • individual • small group in person training
Delivery of training	<ul style="list-style-type: none"> • training administered by a therapist • training done by oneself using exercises designated by a therapist
Treatment dosing	<ul style="list-style-type: none"> • length of training sessions that can range from 3 hours to 75 hours • frequency of training that can range from weekly to daily
Psychiatric rehabilitation	<ul style="list-style-type: none"> • vocational rehabilitation • social skills training • supported employment

Compensatory approaches attempt to bypass cognitive impairments and teach strategies to “compensate” for these impairments by relying on environmental aids or similar processes (Velligan et al., 2006). By “compensating” for cognitive deficits, these approaches aim to promote learning of new skills and, as a result, lead to improved functional outcomes of people

with schizophrenia. Compensatory strategies include use of various tactics, such as relying on signs, checklists and the organisation of belongings to sequence and prompt targeted behaviours (e.g. doing housework, taking medications, going shopping). They may equally employ repetitive learning approaches (i.e. drill and practice) designed to eliminate errors during learning and task performance and encourage error-free execution of tasks. In other words, training tasks are broken into smaller components, or sub-tasks, so that the simplest components are trained first and are followed by more complex ones. Each component is then practiced until the trainee commits no errors during task completion (Veligan et al., 2006; McGurk et al., 2007).

To date, the success of both cognition-enhancing and compensatory methods at improving cognition and functional outcomes of people with schizophrenia has been encouraging. Improvements in cognition have been reported using a range of computerised and non-computerised training methods regardless of additional psychiatric rehabilitations (McGurk et al., 2007). However, improvements in functional outcomes as a result of cognitive remediation alone have been more modest and variable than those following cognitive remediation in conjunction with psychiatric rehabilitation. According to comprehensive, critical reviews by McGurk and colleagues (2007) and Wykes and Huddy (2009), improvements in functional outcomes were significantly enhanced when cognitive remediation was provided in conjunction with any psychiatric rehabilitation (e.g. supported employment, vocational rehabilitation and social skill training) and when cognitive remediation interventions focused on strategy coaching compared to drill and practice.

The reasons for greater effectiveness of combination therapy and strategy coaching are currently not clear. It has been suggested that improvement in cognition may drive improvements in individuals' responses to psychiatric rehabilitation (McGurk et al., 2007). The greater benefits of strategy coaching compared to drill and practice, may be due to improvements in either the ability to transfer skills from the training setting into everyday situations, or the ability to "compensate" for cognitive deficits, or both (McGurk et al., 2007).

Conclusion and Future Directions

There is some evidence that cognitive remediation improves both cognition and functional outcomes of people with schizophrenia, particularly when it focuses on strategy training and is used in combination with supported employment, vocational rehabilitation and social skill training. Given that people at the early stage of psychosis experience impairments in cognition and functioning similar or equivalent to those evidenced by individuals in the later phases of their illness, it may be beneficial to implement cognitive remediation strategies as early in the course of illness as possible. Despite the promising role that cognitive remediation approaches have in schizophrenia treatment, almost all of them involve ongoing administration and monitoring by a trained therapist. This makes them expensive and not readily accessible in most treatment settings. Development and rigorous scientific testing of new training approaches that would minimize the ongoing need for trained therapists may reduce some of the associated cost and lack of availability in the future.

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