

Cognitive training for divergent thinking in schizophrenia: A pilot study

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ABSTRACT

Individuals with schizophrenia demonstrate deficits in divergent thinking. This ability is indispensable for generating creative solutions and navigating the complexities of social interactions. In a pilot study, seventeen stable schizophrenia outpatients were randomly assigned to a training program for divergent thinking or a control program on convergent thinking. After eight weeks of training, participants in the divergent thinking program had significantly greater improvements on measures of idea fluency, negative symptoms, and interpersonal relations than did participants receiving the control program. These preliminary results suggest that interventions for divergent thinking in schizophrenia may lead to improvements in patients' social functioning.

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1. Introduction

Over the last decade, the connection between cognitive deficits and functional outcome in schizophrenia has been consistently demonstrated (Green, 1996, 2006; Green et al., 2000). These findings have added emphasis to the development of cognitive rehabilitation approaches and their applications to schizophrenia (Bell et al., 2008; Kurtz et al., 2007; McGurk et al., 2007; Twamley et al., 2003; Velligan et al., 2006). We recently suggested that divergent thinking is one neurocognitive skill that deserves consideration as a potential target for intervention (Nemoto et al., 2007). Divergent thinking is typically applied when someone is confronted with questions that do not have a fixed single answer (Guilford, 1967). It is distinguished from convergent thinking, for which a single correct answer can be identified. More than other cognitive domains, divergent thinking is related to negative symptoms (Jaeger et al., 2006). Because most real life situations are unstructured and have no single correct answer for a given problem, intact divergent thinking would appear to be critical

for successful social and interpersonal interactions. Consistent with this view, we recently found divergent thinking deficits in patients with schizophrenia using qualitative measures (Mizuno and Kashima, 2002; Nemoto et al., 2005; Yamashita et al., 2005). Also, in a separate study, we found that the impairment in generating high-quality responses on divergent thinking tasks was an important determinant of poor community functioning for patients (Nemoto et al., 2007).

Based on our recent findings of a relationship between divergent thinking and community functioning (Nemoto et al., 2007), we developed a training program specifically for divergent thinking deficits in schizophrenia and evaluated its effects on measures of divergent thinking (e.g. fluency measures), negative symptoms, and social functioning in a pilot study.

2. Methods

2.1. Participants

Seventeen Japanese stable outpatients with schizophrenia (9 men, 8 women) were recruited at 2 psychiatric hospitals (Oizumi Hospital and Jiundo Hospital) in Tokyo, Japan. Two trained psychiatrists diagnosed participants using the ICD-10 criteria (World Health Organization, 1993). The mean age of the patients was 30.3 (SD=5.6) years, mean number of years of education was 13.0 (SD=1.9), and mean illness chronicity was 5.4 (SD=4.7) years from first psychotic symptoms. All patients were taking antipsychotic

Abbreviations: ANOVA, analysis of variance; GAF, Global Assessment of Functioning; ICD-10, International Classification of Diseases, Tenth Revision; PANSS, Positive and Negative Syndrome Scale; SFS, Social Functioning Scale; WAIS-R, Wechsler Adult Intelligence Scale—Revised.

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medications. Subjects were excluded if they had a history of alcohol dependence, substance abuse, or a neurological illness. Subjects were selected for right-handedness, as classified by the Edinburgh Inventory (Oldfield, 1971).

2.2. Materials

2.2.1. Cognitive training programs

Tasks that assess divergent thinking abilities present problems that have multiple solutions. Conversely, standard cognitive tasks typically assess convergent thinking, as they commonly have a single correct solution. Using teaching materials designed to improve thinking flexibility (Ito, 2002), we have developed a number of exercises to improve divergent thinking. For example, in the “rock–paper–scissors task” (Fig. 1) participants are asked to extend a single stroke with a pencil connecting icons, “rock,” “paper,” and “scissors,” in that order, for as long as possible. Subjects can find several starting points (i.e. any rock), and there are many ways to extend strokes for each starting point. In addition to the rock–paper–scissors task, we also developed other tasks, including one called the “calculation tiles

task.” In this task subjects are provided with a grid (8 by 12) in which each cell contained a number ranging from 1 to 9. Subjects were also given several odd-shaped pieces created out of tiles. When placed on the grid, the shapes covered 6 of the numbers. The goal was to place the shapes in a way so that the 6 covered numbers yielded the highest sum. Several alternate versions of each task were constructed.

The control program consisted of making calculations and transcribing kana words into kanji (words were at elementary school level in Japan). Each of these tasks has only one correct answer, and thus involves convergent thinking. We compiled eight workbooks, each of which was to be completed in one week, for each of the two programs.

2.2.2. Outcome measures

The primary outcome measures evaluating divergent thinking included the Idea Fluency Test and the Design Fluency Test (Nemoto et al., 2005). These tests yield two types of indices: a lower level “stereotyped” response, and a “high-quality” response. We were interested in high-quality responses that require a change in viewpoint and flexibility of thinking. An example of a high-quality

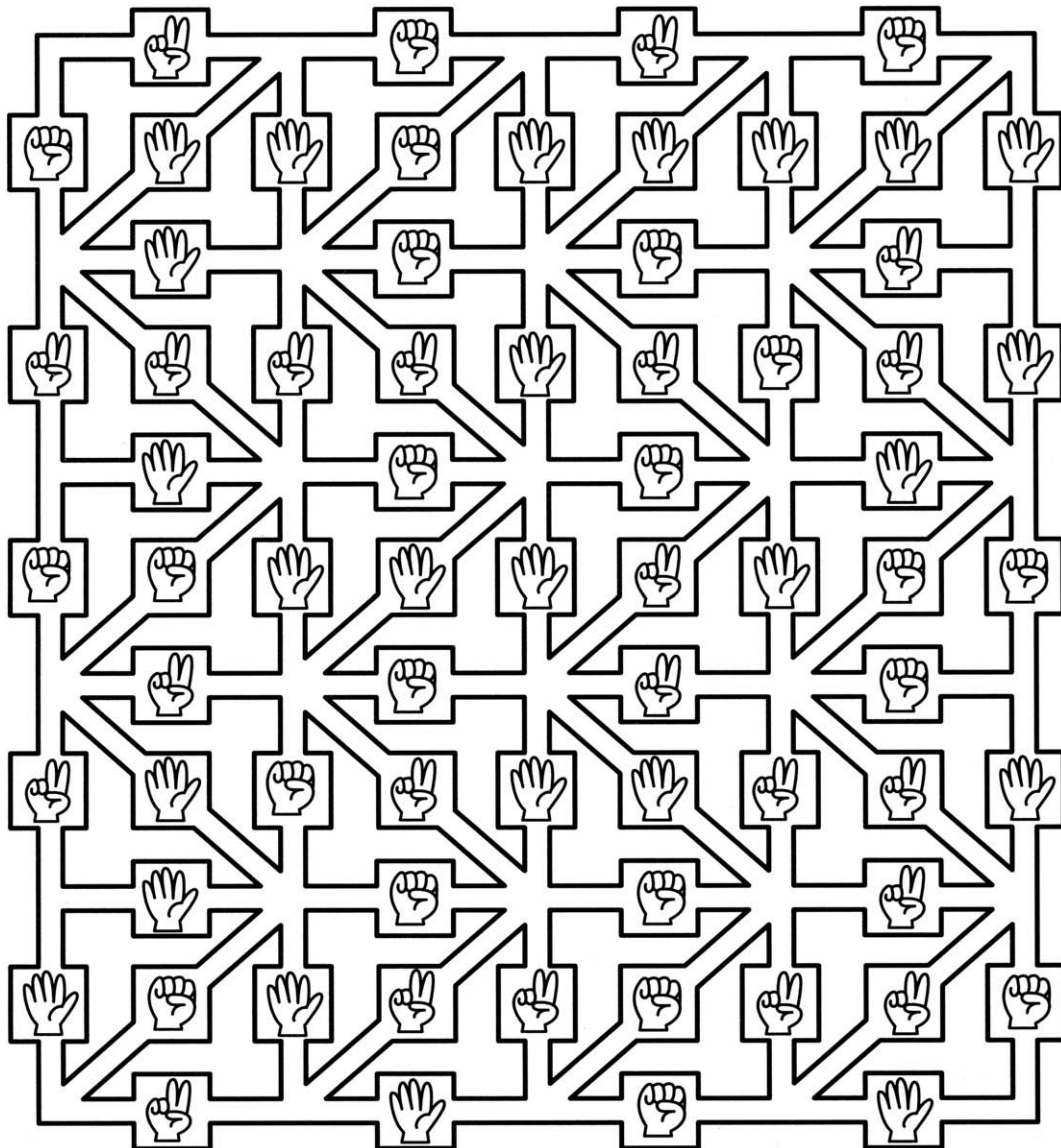


Fig. 1. The “rock–paper–scissors task” is one representative exercise designed to improve divergent thinking. Reprinted from The Paper Challeran, Ito, R., Rock–paper–scissors task, page 10, 2002, with permission from PHP Institute.

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