Original Article

The Effect of Sensory Room Intervention on Perceptual-Cognitive Performance and the Psychiatric Status of Schizophrenics

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Objective: Individuals with schizophrenia show perceptual-cognitive abnormalities. Moreover, depression and anxiety are integral components of the disease most of the times. Psychiatric patients under institutional care experience lack of control and choice-making in their daily lives. Sensory room is an environment in which individuals can choose, control and explore the stimuli around them. So, they can organize their responses to their environment and restore and develop their skills, interacting through it.

Method: 48 people met the study's inclusion criteria. They were evaluated with Lowenstein Occupational Therapy Cognitive Assessment, Mini Mental State examination, and Positive and Negative Syndrome Scale. Then they were randomly and equally assigned to intervention and comparison groups. The Intervention group received sensory room intervention and the comparison group had its traditional therapies. After 32 treatment sessions, 14 participants in the intervention group and 7 participants in the comparison group were excluded from the study and the tests were repeated for the remaining ones.

Results: Our findings did not show a significant effect of sensory room intervention on perceptual-cognitive performance and psychiatric status of people with schizophrenia ($p > 0.05$). In the reminding domain, however, results indicated maintenance of the skill in the intervention group ($p > 0.05$), and its exacerbation in the comparison group ($p < 0.05$).

Conclusions: No significant change in perceptual-cognitive performance and psychiatric status of individuals with schizophrenia was found during the 3 month period of sensory room intervention, except for reminding which did not change significantly in the intervention group, but regressed in the comparison group after the intervention period.

Keywords: Sensory room intervention, schizophrenia disorder, perceptual-cognitive performance, psychiatric status.

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Introduction

Schizophrenia is manifested across a range of symptom categories and perceptual-cognitive deficits. Cognitive-perceptual skills enable humans to function in everyday life: personal, social, and occupational. The ability to absorb sensory inputs and to use them to interact with the surrounding world, to attend to things in a selective and focused way, to concentrate over a period of time, to learn new information and skills, to plan, to determine strategies for actions and to execute them, to comprehend language and to use verbal skills for communication and self-expression, and to retain information and manipulate them in solving complex problems are examples of mental processes that are referred to as cognitive-perceptual functions (1). All these abilities are impaired to some extent in individuals with schizophrenia. Gold suggests that measures of episodic memory, ideational fluency and aspects of complex attention appear to be most impaired; and measures of semantic knowledge and visual-perceptual skills seem to be least affected by the illness (2). Cognitive impairment has emerged as an important new target in schizophrenia therapeutics in light of evidence that cognitive deficits are critically related to the functional disability that is characteristic of the illness.

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On the other hand, because of low quality of life, social stigma, expressed emotions in family and many other reasons, people with schizophrenia suffer from other concurrent problems such as stress and depression. In schizophrenia, stress has been predominantly described in terms of the impact of life events and expressed emotions. In several studies, the impact of stressful life-events on psychotic de-compensation and relapse frequency has been well established. Furthermore, once the disease has developed, the degree of expressed emotions within a family has been described to worsen or ameliorate de-compensation in schizophrenic patients, respectively. Even more important may be the observation that in contrast to major life events, relative minor stresses, or the so-called daily hassles, seem to determine by large the subjectively experienced stress in schizophrenic patients. These relative minor stresses may even be predictive of relapse susceptibility (3).

Depression is a frequently occurring symptom in schizophrenia, either as a medication effect or in response to disease consequences. Depressive symptoms are important not only because they significantly contribute to the suffering caused by the illness, but also because they exacerbate deficits in psychosocial functioning and commonly precede attempted and completed suicide (4).

Negative psychological and perceptual-cognitive deficits in people with schizophrenia can, in part, occur because of institutional conditions. In most of the care settings, people with mental diseases, have a limited degree of control and choice in all aspects of their lives. These people spend much of their time in a setting which can be un-stimulating or offer no variation in stimulation. Physical, sensory and cognitive impairments further decrease the amount of significant stimulation that an individual receives. Impaired cognitive ability also restricts the individual's ability to understand the received stimulation. Such deprivation of meaningful sensations can have negative outcomes like anxiety, stress, depression, disturbed behavior (5), and exacerbation of cognitive deficits, because learning occurs in response to environmental contact (6).

The purpose of this study was to investigate the effect of sensory room intervention on perceptual-cognitive performance (i.e. registration, attention and calculation, reminding, orientation for time, orientation for place, perception, and visuomotor organization) as well as psychiatric status (i.e. anxiety, tension, and depression) of people with schizophrenia.

Sensory room is an environment designed for multi-sensory treatment, containing a variety of equipments providing input to the tactile, vestibular, proprioceptive, visual, auditory, olfactory, and gustatory systems. There are a variety of therapeutic spaces that may be categorized under the umbrella of sensory room-including sensory modulation rooms, sensory integration rooms and snoezelen rooms. In mental health settings, one or more sensory rooms can be created that is categorized as the sensory modulation room (7).

The main goal of sensory room intervention is facilitating interaction with the world which is perceived by means of sensory modalities. So, an individual's ability to interact with the environment is influenced by how effectively and efficiently s/he is able to process and use sensory information. There is evidence that many persons with schizophrenia have signs of sensory processing and integration dysfunction (8, 9). They are not able to process and use sensory information well. So, they cannot function properly in their daily lives.

The real goal of occupational therapy is functional improvement. The value of multi-sensory treatment is its ability to influence brain function which in turn facilitates improvement in mental skills and behavior in response to a novel, controlled, and safe stimulation. Specific stimulation of the primary senses in an environment that excludes all extraneous stimulation makes perception and interpretation of those sensations easier for patients and alleviates the effects of sensory deprivation. The stimulation can then be adapted according to the individual's responses to it, thus making the experience increasingly appropriate and positive. In this way there is no need to express inappropriate behaviors so the adaptive responses develop and pave the way for the participant to interact with and learn from his environment (1). Cognitive-perceptual deficits in schizophrenia have been well documented using broad clinical neuropsychological batteries in dozens of studies in the last two decades. Mohamed et al. (10) administrated a comprehensive clinical and neuropsychological evaluation on a group of ninety-four patients experiencing their first episode of schizophrenic illness and 305 normal comparison subjects. Patients performed significantly worse than the comparison subjects on almost every neuropsychological variable. They concluded that significant cognitive impairment across multiple ability domains is a core characteristic of schizophrenia and is not caused by chronic illness, treatment, or

institutionalization. Doniger et al. (11) examined object recognition in 26 subjects with schizophrenia and 23 non-psychiatric comparison subjects. The results support models of widespread dysfunction in information processing in schizophrenic patients involving both sensory and cognitive regions. They proposed impaired sensory processing as a basis for object-recognition deficits in schizophrenia.

Silver et al (12) studied visuomotor function in 36 schizophrenic patients treated with atypical antipsychotics and in 22 comparison subjects. Patients showed significant disturbances in the ability to trace objects on screen and in keeping pace with a moving target in tracking tests. The impairments were not related to medication dose or to extra-pyramidal side effects. They concluded that visuomotor impairment may be part of illness-related pathology in schizophrenia.

Anxiety can be a manifestation of sensory modulation dysfunction. Pfeiffer and Kinnealey (13) demonstrated a significant correlation between anxiety and sensory defensiveness in fifteen normal adult subjects. Brown et al (9) compared sensory processing deficits of twenty-seven individuals suffering from schizophrenia with thirty patients diagnosed with bipolar disorder and twenty-nine healthy subjects. When compared to the mentally healthy group, both the schizophrenic and bipolar disorder groups had higher scores on sensory avoidance, sensory seeking and poor registration subscales of adult sensory profile.

Since King's (8) first publication outlining the rationale and application of multi-sensory treatment techniques with the chronic schizophrenic population, there have been several researchers who have attempted to test her hypothesis. In a review of occupational therapy with schizophrenic patients, Reisman and Blakeney (14) involved five schizophrenic patients in daily sessions of sensory integration therapy for a seventeen weeks period and observed changes in the scores of sensory integration measures and psychiatric status. Baillon et al. (5) reviewed studies conducted from 1991 to 1999 and proposed the benefits of using multisensory therapy in different kinds of disorders such as: positive changes in behavior; improved task concentration, an increase in a variety of skills such as awareness of self, social interaction behaviors, communication, exploration and manipulation of stimuli; relaxation; and a reduction in stereotypic self-stimulatory behaviors and an increase in adaptive behaviors such as exploratory behaviors or initiating contact with others.

Sabbarre (15) meta- analysis results showed that sensory integration and modulation treatment approaches are not more effective comparing to the other therapeutic interventions in specific outcome areas of psycho-education, motor function, behavior, language, and sensory- perceptual function. In comparison to no treatment alternatives, there are some values for sensory techniques. Other studies reviewed, not critically appraised, mentioned similar results to this meta-analysis but also commented on the significance of group intervention method comparing to improved social behavior whereas it provides a close social context for peer interaction (14).

There are limited studies published from 1990 to 2007 (one was found to date), specifically evaluating the effectiveness of multi-sensory therapy with the early psychosis and schizophrenia population. The majority of studies on this topic were published between 1970’s and 1980’s.

Champagne (7) focused on the effects of the use of sensory room on the level of distress in forty-seven patients with psychiatric diseases including schizophrenia. After ninety-six sessions of treatment, ninety-eight percent of the participants reported a positive change.

Study Purpose - This study sought to determine whether sensory room-based intervention would be successful in improving perceptual-cognitive performance and psychiatric status in the general schizophrenia inpatient population. Such approaches in this population remain in the early stages of implementation and without measurable indications of effectiveness.

Method

Sample and Setting - This study took place at Razi Educational, Clinical, and Psychiatric Center in Shahr-e-Rey, Tehran, Iran. The participants were recruited from six wards of the hospital, designed for long term hospitalization. Seventy-one Subjects met the criteria for inclusion in the study. All subjects had a DSM-VI diagnosis of non-paranoid schizophrenia, characterized by long term admissions. Age of subjects ranged from 40 years to 60 years. None of them could leave the hospital for community living at the time of performing this study because of inability to live independently or psychiatric symptoms. All of the subjects were in 10 to 50 range of Global Assessment of functioning (GAF) at the beginning of the study. GAF was performed by staff who had known subjects for at

least 6 months in order to screen subjects with higher levels of dysfunction. After a brief interview with each subject, 48 (24=men, 24=women) subjects interested in the intervention entered the study as primary participants. They gave informed verbal consent before participating.
The sensory rooms used in this study included two rooms: one in ward number 4 for the women, and one in ward number 6 for men. The first one was approximately 8×12 and the second one was approximately 6×8. Both rooms had almost the same equipments and setting and were in their initial stages of development.
The subjects attended occupational therapy for the sensory room intervention sessions in lieu of the regularly scheduled occupational therapy mainly including exercise therapy, recreational therapy, training activities of daily living, and teaching crafts. Other kinds of therapies such as psychological and medication were available as well.

Instruments

Global Assessment of Functioning (GAF) - Global assessment of functioning (GAF) is a numeric scale (0 through 100) used by mental health clinicians and physicians to subjectively rate the social, occupational, and psychological functioning of adults, e.g., how well or adaptively one is meeting various problems-in-living. The scale is presented and described in the DSM-IV on page 34. The score is often given as a range.
The examiner must rate the individual according to his global function in the last six months or one year. This Instrument was used to screen patients with higher levels of dysfunction.

Mini Mental State Examination (MMSE) - The Mini–Mental State Examination (MMSE) or Folstein test is a brief 30-point questionnaire used for screening cognitive impairments. It estimates the severity of cognitive impairment at a given point in time and is useful to follow the course of cognitive changes in an individual over time, therefore is regarded as an effective way to document an individual's response to treatment. The Mini-Mental Status Examination offers a quick and simple way to quantify cognitive function and screen for cognitive loss. It is an 11-question measure that tests five areas of cognitive function: orientation, registration, attention and calculation, recall, and language. In this study, areas of registration, attention and calculation, and recall were examined.
The MMSE takes 5-10 minutes to administer.
Each section of the test involves a related series of questions or commands. The individual receives one point for each correct answer.
To give the examination, the individual must sit in a quiet, well-lit room. The examiner asks him/her to listen carefully and to answer each question as accurately as s/he can.
To score, the number of correct responses is added. The individual can receive a maximum score of 30 points. A score below 20 usually indicates cognitive impairment.
Since its creation in 1975, the MMSE has been validated and extensively used in both clinical practice and research.

Positive and Negative Syndrome Scale (PANSS) - The PANSS or the 'Positive and Negative Syndrome Scale' is a medical scale used for measuring symptom severity of patients with schizophrenia. It was published in 1987 by Stanley Kay, Lewis Opler, and Abraham Fiszbein. The name refers to the two types of symptoms in schizophrenia, as defined by the American Psychiatric Association: positive symptoms, which refer to an excess or distortion of normal functions, and negative symptoms, which represent a diminution or loss of normal functions. To assess a patient using PANSS, an approximately 45-minute clinical interview is conducted. The patient is rated from 1 to 7 on 30 different symptoms based on the interview as well as reports of family members or primary care hospital workers. Each item on the PANSS is accompanied by a complete definition as well as detailed anchoring criteria for all seven rating points, which represent increasing levels of psychopathology: 1 = absent, 2 = minimal, 3 = mild, 4 = moderate, 5 = moderate severe, 6 = severe, and 7 = extreme. In this study three subscales of general psychopathology scale were assessed including anxiety, tension, and depression.

Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) - The Loewenstein Occupational Therapy Cognitive Assessment (LOTCA) was developed at Loewenstein Rehabilitation Hospital (LRH) in Israel in 1974. The LOTCA battery is derived from clinical experience, as well as from neuropsychological and developmental theories and evaluation procedures by Luria in 1973 and Inhelder and Piaget in1974.
The LOTCA contains 20 subscales and is divided into four areas: 1) orientation 2) perception 3)

visuomotor organization and 4) thinking operations. In this study the first three areas were assessed.
Administration of the battery takes 30 to 45 minutes and it can be divided into two or three sessions of lesser time if necessary. The results of the assessment are recorded on the scoring sheet which provides a profile of the patient's performance.

Procedure

Subjects were tested in 3 weeks before treatment. All the assessments were performed by occupational therapists other than the authors, who were trained in administrating and rating the tests. At the beginning of the 4th week, subjects were provided a program that followed a range of un-patterned visual, auditory, olfactory, tactile, gustatory, proprioceptive and vestibular stimuli and activities. In general, the activities were designed to follow some of the principles outlined by Ayres (16) and Champagne (7). Specifically, like the sensory activity they must be 1) pleasurable 2) failure-free 3) under the user's control 4) non-directive and give the client a feeling of independence and choice.
Primary participants attended intervention sessions individually. During the intervention, 14 participants in the intervention group and 7 participants in the comparison group were excluded from the study due to such reasons as physical illness, relapse, short term recovery and loss of interest in the intervention. In the first sessions, the occupational therapist led participants around the sensory room, while naming each stimulus and briefly modeling its appropriate use, and introducing and modeling motor acts. The therapist manually guided the participant to activate or use the equipment (e.g. to turn on electrically operated stimuli, manipulate non-electrical stimuli) or do motor acts. After a few sessions, according to each individual's ability and interest, participants were free to either manipulate or look at each item and to do motor acts, move around the room and interact with the sensory equipment at their own pace. The therapist gave no direction to participants unless requested by them or to those who were so passive that they could not act independently. If the latter was the case, the therapist offered him/her an activity or stimulus and adapted its intensity or pace according to the participant's preference.
The time and equipments used was different for each subject, based on his/her tolerance and preferences. In general, the intervention included: 1) greeting 2) reviewing what has been done in the previous session 3) interacting with the sensory equipments or doing sensory activities and 4) expressing the feeling about the activities in brief.
Some examples of the types of treatment used in the sensory room includes the following: general exploration and use of the environment and equipment in the room, deep breathing, sensorimotor activities, stretching, isotonic and isometric exercises, application of various touch activities including deep pressure or vibration, doing simple crafts, collage, painting either with instruments or fingers. The equipment and the type of sensory input provided are listed in Table 1.

Table 1. Equipment and its sensory properties

Equipment	Sensory properties
Therapy ball	Proprioception and vestibular
Rocking chair	Vestibular
Spinning chair	Vestibular
Brush	Deep pressure touch
Trampoline	Proprioception and vestibular
Tilt board	Proprioception and vestibular
Vibrator	Deep pressure touch and Vibration
Floor mat	Deep pressure touch
Putty hand exerciser	Proprioception and deep pressure
Thera Bands	touch
Hand exerciser balls	Proprioception
Collage items	Proprioception and deep pressure
Art supplies: paint by	touch
number,	Tactile, proprioceptive, visual,
watercolor paints,	olfactory
crayons, markers,	Tactile, proprioceptive, visual
colored pencils,	
pastels, colored papers	
DVD Player	Auditory
Aroma therapy candles	Olfactory
and sprays	Gustatory
Chocolates and	
candies with	Visual
different tastes	Visual
Mirror	Visual and tactile
Systems for light	
effects	
Sprays of happy snow	

All of the 32 intervention sessions (in 3 months) were conducted by the second author of this study. Each session lasted for 15 to 40 seconds, three days per week. After the last treatment session, the tests were administrated for the remaining participants: 10 (including 6 men and 4 women) in the treatment group and 17 (including 8 men and 9 women) in the comparison group.

Data Analysis

SPSS version 16.0 was used to analyze the data in this study. The researchers entered data as they were collected. The one-sample Kolmogorov-Smirnov test was used to test whether the variables were normally distributed .The data was analyzed using

paired t-test to determine if there were differences between pre- and post-test scores on the MMSE, LOTCA, and PANSS from pretest to post-test for each group. Independent *t* test compared the changes in scores of the comparison group with the score changes of the intervention group.

Results

No significant difference was observed in changes in scores of the comparison group relative to the intervention group, in any of the LOTCA subtests; orientation for time ($p = 0.856$), orientation for place ($p = 0.253$), perception ($p = 0.459$), and visuomotor organization ($p = 0.609$).

After treatment, neither the comparison nor the intervention group had made significant changes in the scores on the LOTCA subtests including orientation for time (intervention subjects: $p = 0.798$; comparison subjects: $p = 0.455$), orientation for place (intervention subjects: $p = 0.104$; comparison subjects: $p = 1.000$), perception (intervention subjects: $p = 0.269$; comparison subjects: $p = 0.555$), and visuomotor organization (intervention subjects: $p = 0.306$; comparison subjects: $p = 0.846$).

No significant difference was found upon comparing the two groups in items of registration ($p = 1.000$), and attention & calculation ($p = 0.778$) in MMSE score changes. However, there was a significant difference between the two groups in reminding ($p < 0.05$).

Comparing pre- and post-MMSE scores of registration (intervention subjects: $p = 1.000$; comparison subjects: $p = 1.000$) and attention & calculation (intervention subjects: $p = 0.645$; comparison subjects: $p = 0.557$) in each group, there was no significant change in either group. In reminding, however, a significant change was found in the comparison group, but not in intervention group (intervention subjects: $p = 0.168$; comparison subjects: $p = 0.014$); indicating maintenance of the skill in the intervention group and its exacerbation in the comparison group.

Where the PANSS subscales scores were concerned, anxiety ($p = 0.200$), tension ($p = 0.950$), and depression ($p = 0.549$) showed no significant difference between the intervention and comparison groups. There was no significant difference between pre- and post-PANSS scores in either group, including anxiety (intervention subjects: $p = 0.1.000$; comparison subjects: $p = 0.165$), tension (intervention subjects: $p = 0.662$; comparison subjects: $p = 0.387$), and depression (intervention subjects: $p = 0.591$; comparison subjects: $p = 1.000$).

After 3 months of sensory room intervention, except for reminding, the scores of perceptual-cognitive performance and psychiatric status in schizophrenic patients had not changed in the LOTCA, MMSE, and PANSS with respect to the comparison group (table 2 & table 3).

Table 2. Independent t-test for comparison of Pre- and Post-Therapy on LOTCA, MMSE, and PANSS in two groups

	Test Mean	SD	t	p
LOTCA				
Orientation for time G1				
Orientation for time G2	0.176	0.951	-0.183	856.0
	0.100	1.197		
Orientation for place G1				
Orientation for place G2				
	0.000	0.935	1.170	0.253
Perception G1	0.400	0.699		
Perception G2				
Visuomotor organization G1	0.050	0.342	0.752	0.459
Visuomotor organization G2	0.164	0.439		
MMSE	0.068	0.379	0.517	0.609
Registration G1	0.152	0.443		
Registration G2				
Attention and calculation G1	0.000	0.000	-	-
Attention and calculation G2	0.000	0.000		
Reminding G1	-0.500	2.592	0.286	0.778
Reminding G2	-0.222	1.394	2.131	0.047
PANSS				
Anxiety G1	-0.812	1.276		
Anxiety G2	-0.100	0.316	1.333	0.200

	Test Mean	SD	t	p
Tension G1	-0.461	1.126	0.063	0.950
Tension G2	0.000	0.471		
Depression G1	-0,230	0.926	-0.609	0.549
Depression G2	-0.200	1.398		
	0.076	1.307		
	-0.200	1.135		

G1= Comparison group, G2= Intervention group

Table3. Paired T-test for comparison of pre-test and post-test means of the LOTCA, MMSE, and PANSS in each group

	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Registration					
Pretest G1	3.0000[a]	.00000	.00000		
Post test G1	3.0000[a]	.00000	.00000		
Pretest G2	3.0000[a]	.00000	.00000		.
Post test G2	3.0000[a]	.00000	.00000		
Attention and calculation					
Pretest G1	2.6000	1.64655	.52068		
Post test G1	2.1000	2.07900	.65744	0.610	0.557
Pretest G2	2.7778	1.98606	.66202		
Post test G2	2.5556	1.66667	.55556	0.478	0.645
Reminding					
Pretest G1	2.5625	.81394	.20349		
Post test G1	1.6875	1.30224	.32556	2.782	0.014
Pretest G2	2.7000	.94868	.30000		
Post test G2	2.5000	.97183	.30732	1.500	0.168
Time orientation					
Pretest G1	2.7647	1.30045	.31541		
Post test G1	2.9412	1.19742	.29042	-0.765	0.455
Pretest G2	2.6000	1.34990	.42687		
Post test G2	2.7000	1.05935	.33500	-0 264	0.798
Place orientation					
Pretest G1	3.1176	1.21873	.29558		
Post test G1	3.1176	.99262	.24075	0.000	1.000
Pretest G2	3.0000	1.24722	.39441		0.104
Perception					
Pretest G1	3.5994	.37345			
Post test G1	3.6494	.33818	-0.602	0.555	
Pretest G2	3.5600	.57604		.	
Post test G2	3.7240	.28964	-1.179	0.269	
Visuomotor organization					
Pretest G1	1.9871	.74488			
Post test G1	2.0055	.70291	-0.198	0.864	
Pretest G2	2.2800	.83670			
Post test G2	2.4320	.89845	1.085	0.306	
Anxiety					
Pretest G1	2.0769	.95407			
Post test G1	1.6154	.65044	1.477	0.165	
Pretest G2	2.5000	1.17851			
Post test G2	2.5000	1.17851	0.000	1.000	

	Mean	Std. Deviation	Std. Error Mean	t	Sig. (2-tailed)
Tension					
Pretest G1	1.8462	.80064			
Post test G1	1.6154	.76795	0.898	0.387	
Pretest G2	2.1000	.99443			
Post test G2	1.9000	.99443	0.452	0.662	
Depression					
Pretest G1	1.9231	.64051			
Post test G1	2.0000	1.22474	0.267	0.794	
Pretest G2	2.8000	1.31656			
Post test G2	2.6000	1.07497	0.557	0.591	

	Mean	Std. Deviation	t	Sig. (2-tailed)
Perception				
Pretest G1	3.5994	.37345		
Post test G1	3.6494	.33818		
Pretest G2	3.5600	.57604	-0.602	0.555
Post test G2	3.7240	.28964	-1.179	0.269
Visuomotor organization				
Pretest G1	1.9871	.74488		
Post test G1	2.0055	.70291		
Pretest G2	2.2800	.83670	-0.198	0.864
Post test G2	2.4320	.89845	1.085	0.306
Anxiety				
Pretest G1	2.0769	.95407		
Post test G1	1.6154	.65044		
Pretest G2	2.5000	1.17851	1.477	0.165
Post test G2	2.5000	1.17851	0.000	1.000
Tension				
Pretest G1	1.8462	.80064		
Post test G1	1.6154	.76795		
Pretest G2	2.1000	.99443	0.898	0.387
Post test G2	1.9000	.99443	0.452	0.662
Depression				
Pretest G1	1.9231	.64051		
Post test G1	2.0000	1.22474		
Pretest G2	2.8000	1.31656	0.267	0.794
Post test G2	2.6000	1.07497	0.557	0.591

Discussion

Based on our study results, except for reminding, 3 months of sensory room intervention produced no significant effect on perceptual-cognitive performance in the intervention group compared to itself in the pre-intervention period, or, to the control group.

Some of the reasons are as follows. First, we must point out the fact that in this study, registration domain was intact in all of the participants. Therefore, we did expect it to be affected by the intervention.

In the attention & calculation domain, there was no significant difference between the two groups. Besides, none of the groups had had a significant change after treatment, compared to their previous statuses. A probable reason behind this could be the way this domain was assessed. In this study attention was assessed, using calculation abilities. Maybe mathematical skills were regressed due to years and years of hospitalization in the participants of this study. Because the intervention was not focused on specifically restoring these skills it did not affect it either.

However, in the reminding domain, a significant difference between the two groups was found, such that, the intervention group saw no significant change after treatment, compared to before. On the other hand, the comparison group had observed

regression. This may be due to the way the intervention was done. In every session the participant was asked to remember what had been done in the previous session; how the activities were done, how the equipments worked, and how s/he felt about them. This way the subject was encouraged to remember what had been learned or experienced before. On the other hand, a multi sensory environment induces self-initiated manipulations (15). Therefore, feelings of control and choice develop which encourage the subject to remember past information and experiences, and to use them to interact with the environment. One of the goals of occupational therapy is maintenance of abilities (17); facilitating meaningful interaction with the environment and helping the subject use his/her skills and abilities. Therefore, the process of regression slows down as a result of the disorder or institutional conditions (18).

Probably, the lack of significant change in time orientation and place orientation in the groups is related to the institutional conditions. All of the participants had been hospitalized for at least 2 years in Razi hospital or other care settings which they had left rarely, accompanied by staff or family members. As a result, they did not know where the hospital was located exactly. Besides, they stated that due to stable conditions and their reliance on staff or family members in doing daily activities, knowing the exact date or time seemed unnecessary to them.

As demonstrated in table 3, after treatment, neither the control nor the intervention group had exhibited significant changes in scores of perception and visuomotor organization subtests. Moreover, no significant difference was observed upon comparing the two groups with each other. A possible explanation for the lack of improvement of individuals in most of the items evaluated may be the length and frequency of the study. Enriched environmental conditions facilitate neural changes, or neuro-plasticity, defined as the nervous system's ability to change in response to environmental input and demands (16). Lane and Shaaf (18) indicated that the period of exposure required is at least 1 hr per day over a few weeks to induce these neural changes, followed by behavioral changes. Reisman and Blakeney (14) supported the hypothesis that amount of treatment time is directly related to improvement. Unfortunately, disease-related problems and the participants' low tolerance prevented the study group from increasing the length and frequency of the intervention. Another explanation is that the intervention was not generalized to the real environment. Lane and Shaaf (18) stated that sensory enriched environments which offer the participants control over activity, novelty, and lifelike context, enhance the brain's processing of information and provide a foundation for learning. In this study the sensory room was rich in novel sensory inputs and was designed to induce feelings of choice and control in the subject. However, first because of the limited length of intervention, and second, due to institutional conditions, the participants spent much of their time in their real environment, an almost unstimulating and unchanging environment which offered them less opportunity to make choices and exert control.

Another explanation is motivational factors. Rosenzweig and colleagues found that active exploration of the environment was crucial for neuroplastic changes in the brain. In other words, the subjects needed to explore for themselves; simply being exposed to the environment without exploring it was not sufficient to result in neuroplastic changes (18). One of schizophrenia's symptoms is amotivation (19). So, the schizophrenic participants in the intervention group needed increased levels of encouragement and prompting to engage in sensory activities. During the first sessions, specifically, most of them were often not interested in novel activities and were dependent, more or less on the therapist for selecting the stimuli. This changed, after some weeks, however, to some extent, but did not reach the level of independency expected to be necessary for change. Many clinicians believe that the feeling of independence and choice is an important factor of how multi-sensory therapy works (5).

Finally, it must be stated that according to what Hubel and Wiesel showed, function did not necessarily return after a period of deprivation or lesion. Thus, there appear to be limits to the degree of plasticity in organization and function (18). Sabarre (15) reviewed 4 studies published from 1990 to 2007 and concluded that sensory integration treatment approaches are no more effective than other treatment interventions in specific outcome areas such as sensory- perceptual function for psychotic patients. Sabarre (16) proposed that due to limited number of studies, more research is needed to assess the value of sensory treatments in this group. Our research was done in favor of this commitment.

We found that 3 months of sensory room intervention produced no significant effect on the psychiatric status of the intervention group

compared to either the pre-intervention period or the control group. One reason to explain this lack of improvement is the limited number, period, and frequency of intervention. Another is the major clinical benefit of sensory interventions which is the notion of choice and control (7). People with severe and multiple handicaps often experience very limited psychological and sensory stimulation, particularly in institutional care, and have a limited degree of control and choice in all aspects of their real lives (5). We believe that because of this fact and because of the limited period of intervention, it was not possible to fully give the participants feelings of choice and control. Perhaps this could be done by increasing the duration and numbers of therapy sessions.

Another factor must be considered here as well. In people with mental illness, there are many factors other than sensory deprivation that can cause depression and anxiety. Examples include expressed emotions, life events, and poor social adjustment (3-4). The authors of this study feel that if sensory room intervention was accompanied with approaches like family therapy and social skills training, it would yield more change in the intervention group.

Furthermore, we wished to offer a treatment protocol which included providing insight into the effects of sensory deprivation on daily life and, how the intervention would work. However, impaired cognitive ability restricted the participants' ability to make sense of the treatment that was to be received. Perhaps if this was not the case the therapy would have become more meaningful to and the participants and effective too.

Conclusion

To sum up, the findings of this research study demonstrate no clear pattern of improved perceptual-cognitive performance and psychiatric status in schizophrenic patients after 3 months of sensory room intervention. The only domain affected was reminding which did not change significantly in the intervention group, but which regressed in the control group after the intervention period.

Lack of change in most of the domains could be due to the small number of sessions and short duration of intervention, lack of motivation in participants and institutional conditions. Findings on the reminding domain support the idea that multi-sensory interventions could prevent the disease regression process.

Therefore, recommendations include a longer period of intervention to allow patterns of behavior to be established. Also, a standardized assessment specific to schizophrenic individuals with high validity and reliability is recommended to minimize any variability in documentation. Experienced therapists, blind to the study purpose and not knowing the participants, rather than multiple staff, should complete the data collection.

Finally, we recommend this study as a pilot study for future research with greater sample size and increased number of sessions and period of intervention.

Limitations- The length of intervention was not extensive enough to note a significant change in cognitive and psychiatric domains. In particular, individuals with mental illnesses who are hospitalized for years require a daily routine of sensory-enriched activities such as cooking, gardening and walking in open places. Moreover, certain changes in the ergonomic designs of the care settings such as seating variations, flowers and plants, floorboards and wallpapers which offer particular tactile or visual sensations to the patient, and colored lights, can be helpful in producing variation in the stimuli. Multiple staff completion of data led to inconsistency in documentation of the areas in question. In addition, due to institutional policies, we had to make the staff aware of the purpose of the study and how the participants were assigned to the intervention or control groups.

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