

# Effectiveness of Instrumental Music Therapy on Neuro-Cognitive Functioning in Individuals with Schizophrenia

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**Abstract-Past research, proved that cognitive dysfunctions are a primary characteristic of schizophrenia (Bilder et al 2000; Saykin et al 1994). Major alterations have been identified in attention, memory and executive functions in this population. The recent research has emerged that shed new light on intriguing links between music and a variety of cognitive functions, including temporal order learning (Hitch, Burgess, & Culpin 1996), attention (Drake, Jones, & Baruch, 2000), and auditory verbal memory (e.g., Deutsch, 1982). The purpose of this study is to understand the effectiveness of instrumental music therapy on neuro-cognitive functioning in schizophrenic patients. The study is a pre-post experimental design with a control group matched for clinical characteristics. Twenty patients age range 18 - 45 are dividing into three groups of five people each. The one experimental will participate in a series of instrumental music therapy. The control group will not get any kind of intervention. One of the striking findings of this present study was that those who received instrumental music therapy rather than Control group observed more significant improvements in neuro-cognitive functioning.**

## INTRODUCTION

### SCIZOPHRENIA

The schizophrenic disorders are characterized in general by fundamental and characteristic distortions of thinking and perception, and by inappropriate or blunted affect. Clear consciousness and intellectual capacity are usually maintained, although certain cognitive deficits may evolve in the course of time. The disturbance involves the most basic functions that give the normal person a feeling of individuality, uniqueness, and self-direction. The most intimate thoughts, feelings, and acts are often felt to be known to or shared by others, and explanatory delusions may develop, to the effect that natural or supernatural forces are at work to influence the afflicted individual's thoughts and actions in ways that are often

bizarre. The individual may see himself or herself as the pivot of all that happens. Hallucinations, especially auditory, are common and may comment on the individual's behavior or thoughts. (ICD 10, 2016)

Past research identified that cognitive deficits are the major characteristics of Schizophrenia, which play an important role in recovery from schizophrenia. The major alterations have been identified in attention, memory, and executive functions in this population. The recent research has emerged that shed new light on intriguing links between music and a variety of cognitive functions, including temporal order learning, attention and auditory verbal memory. Cognitive retraining is an increasingly being examined to improve cognitive functions in schizophrenia. However, there was no that much any study conducted with instrumental music therapy on schizophrenic patients and there are very few studies of intensive therapy on regular basis in this area. In this context, the present study is undertaken to understand the effectiveness of an instrumental music therapy on neuro cognitive functioning in individuals with schizophrenia.

### Music therapy

Music therapy is a special type of therapy where forms of musical interaction and communication are used alongside verbal communication. (Gold et al, 2008). It is a systematic process of intervention wherein the therapist helps the client to promote health, using music experiences and the relationships developing through them as dynamic forces of change. (Bruscia, 1998). Music Therapy is an established healthcare profession that uses music to address physical, emotional, cognitive, and social needs of individuals of all ages. Music therapy interventions can be designed to promote wellness, manage stress, alleviate pain, express feelings, enhance memory,

improve communication, and promote physical rehabilitation. (*American Musical Therapy Association, 2009*)

#### Music and the Brain

History of the relation between music and the mind is skewed to the effects of music on one function of the mind - emotion. However studies investigating the neurobiological basis of music have intrinsically linked music to various other brain functions as well. Human nervous system processes music in different ways - perceptual processing, emotional processing, autonomic processing, cognitive processing and behavioral or motor processing.

**Perceptual processing:** Although, music stimulates some skin receptors by changes in local pressure, it is primarily made of sound waves that enter the primary acoustic circuit through the outer ear. Human primary acoustic circuit involves auditory nerve, brainstem, medial geniculate body of the thalamus and the auditory cortex.

#### Emotional processing

Now, amygdala, cingulate gyrus and medial orbitofrontal cortex are involved in processing of emotional behaviors. Hence, as these structures are found to have auditory projections, these are proposed to be involved in emotional processing of music. There is evidence also to suggest that music activates these regions. Research on different neuronal responses to pleasant and unpleasant music has found that:

#### Autonomic processing

Music has been found to induce relaxation and to alter pain perception, blood pressure and respiratory and heart rates. Soft, slow, non-lyrical music significantly decreased systolic blood pressure, heart rate, respiratory rate and oxygen saturation. Music with a faster tempo significantly increased heart rate, minute ventilation, blood pressure and sympathetic nervous activity and that music with complex rhythms increased, though insignificantly, the same parameters.

#### Cognitive processing

Cognitive processing of music is hypothesized under two mechanisms: Affective or indirect mediation and non affective or direct mediation. Affective mediation

basically refers to activation of certain cognitive networks by means of activation of emotional music processing networks. Direct or the non affective processing of music basically means activation of regions involved in a particular cognitive function by music.

#### Behavioral or motor processing

Behavioral response to music is most evident in the form of dancing. Functional brain imaging has shown that music activates the cerebellum, basal ganglia and motor area. These areas are reported to coordinate motor movement in response to music. Activation of the mirror neurons, the precuneus region of the parietal lobe, pre supplementary motor area, the supplemental motor area, the dorsal pre motor cortex, the dorsolateral prefrontal cortex, the inferior parietal lobule and lobule VI of the cerebellum is seen during dancing or tapping to musical beats.

### NEED AND SIGNIFICANCE OF THE STUDY

Several studies in the past have tried to explore the influence of music therapy and cognitive training in enhancing neuro cognitive functioning in a patient with schizophrenia. Studies to date have examined the effects of music therapy as an add-on treatment to standard care. The results of these studies suggest that music therapy improves global state and may also improve mental state and functioning if a sufficient number of music therapy sessions are provided. There was no that much any study conducted with the combination of cognitive retraining and music therapy on schizophrenic patients and there is a very few studies of intensive therapy on regular basis in this area. In this context, an attempt is made to understand the effects of an instrumental music therapy on neuro-cognitive functioning in patient with schizophrenia. It will also help to individual with schizophrenia for improving their neuro cognitive functioning.

#### Aim

To assess and see the effectiveness of instrumental music therapy along with cognitive retraining on neuro-cognitive functioning in individuals with schizophrenia

#### Objectives

- To assess and see the effectiveness of instrumental music therapy on working memory in individuals with schizophrenia among IMT group and treatment as usual group in pre, post and follow-up assessment.
- To assess and see the effectiveness of instrumental music therapy on attention in individuals with schizophrenia among IMT group and treatment as usual group in pre, post and follow-up assessment.

#### Hypotheses

1. There will be significant increase on working memory in individuals with schizophrenia in IMT group and treatment as usual group in pre, post and follow-up assessment at within group comparison.
2. There will be significant increase on working memory in individuals with schizophrenia in IMT group and treatment as usual group in pre, post and follow-up assessment at between group comparisons.
3. There will be significant increase on neuro-cognitive functions in individuals with schizophrenia in IMT group as compared to TAU group in pre, post and follow-up assessment.

#### Venue of the study

This study was conducted at Post graduate institute of behavioral and medical sciences, Raipur, Chhattisgarh.

#### Design of the study

This study was a hospital based confirmatory study. In this study a Pre-Test and Post Test Control Group Design will be used. (Campbell & Stanley, 1963)

#### Sample

- Sampling Technique: - purposive sampling technique was used for the present study.
- Sampling Frame: - The samples were constituted of both genders, age range between 18 to 45 years of individuals with schizophrenia.
- Sample Size: A total sample of 15 individuals with schizophrenia who were fulfilling the inclusion and exclusion criteria were selected for the study. Amongst these fifteen patients, ten patients was the part of experimental group and

remaining five patients was the part of control group.

- Source of Sample:-The sample was collected from IPD and OPD at PGIBAMS, Raipur (C.G)

#### Inclusion criteria

- Individuals who were diagnosed with schizophrenia as per ICD- 10-DCR.
- Individuals who were getting pharmacotherapy
- Individuals who were willing to participate and giving informed consent to the present research study.
- Individuals who were able to read and comprehend English and Hindi
- Age range between 18 to 45 years.
- Male and female both were included.
- Duration of the illness was at least one year

#### Exclusion criteria

- Individuals with a history of organicity, epilepsy and other neurological defects.
- Individuals with mental retardation.
- Individuals diagnosed for a concurrent psychoactive substance use.
- Individuals having undergone any psychological intervention for schizophrenia in last six months.

#### Outcome measures

The study carried out using the following outcome measures,

1. Socio-demographic and Clinical Data Sheet (SDCDS)
2. Positive and Negative Syndrome Scale (PANSS)
3. The Digit vigilance test
4. Working memory index (WAIS-III)
5. Standardized instrumental Music for music therapy

#### PROCEDURE

The Aim of the study was undertaken to understand the effectiveness of an instrumental music therapy along with cognitive retraining on neuro cognitive functioning in individuals with schizophrenia. After established the rapport with the patient, Participants meeting inclusion criteria for the study were divided into two groups, i.e., Instrumental music therapy group (IMT) and treatment as usual group. Then baseline assessments were done as per outcome measures.

After the baseline assessment the IMT group was exposed to instrumental music therapy. The treatment as usual group was remaining as usual. The interventions (IMT) were conducted in individual and group setting respectively as per requirement. The intervention was conducted on daily basis. On an average 20 sessions were given to each individual with schizophrenia in IMT group. The control group was not exposed to any intervention. After intervention post assessment was done as per outcome measures. All participants in these two groups continued to receive their regular medication

## RESULTS AND DISCUSSION

This is the first study which has developed and examined the effectiveness and application of instrumental music therapy on neuro-cognitive functioning in individuals with schizophrenia. Taking into consideration the objectives of the study, the groups of Treatment as usual group (TAU) and Instrumental music therapy group were compared on the above-mentioned variable. The findings are discussed below.

On examining the scores obtained in within group comparison by TAU and IMT groups on working memory observed that all the groups were significant ( $\leq 0.05^*$ ) in pre, post, and follow-up assessment. As per the post-hoc analysis more improvements occurred in follow-up assessment. Psychopathology and neuro-executive functions mutually closed to each other. When symptom severity reduced, working memory also improved. This may be the reason for the changes occurred in all the groups in within group comparison. On the other hand, the between comparison of working memory table indicated that significant difference found ( $\leq 0.05^*$ ) in instrumental music therapy group when compared to TAU group in pre, post and follow-up assessment. Post-hoc analysis indicated that more significant improvement occurred in individuals who have received IMT. This findings is matched with Hegde et al., (2007), D'souza and colleagues (2012), Kurtz et al., (2007) and Gholamreza Pasha (2012), Thaut et al., (2009) who investigated and examined the effects of music therapy respectively on working memory in schizophrenic patients and concluded that those patients who received either music therapy had significant improvement in working memory. Here

both techniques were applicable and Instrumental music therapy was very effective to the patient.

Table 2 showed the within group comparison of Digit vigilance test which used to assess the sustained attention and psychomotor speed. From the table it was observed that there were no significant differences seen in TAU in terms total time taken. Hence there was significant difference seen in IMT group in pre, post and follow-up assessment. This means that IMT group took less time when compared to TAU group. On examining the differences in total error made by the group observed that the significance difference seen in all the groups. Post-hoc analysis showed that patients who made less error in follow-up assessment when compared to pre and post assessment. When looking to overall analysis of within group comparison it may be inferred that there was significant improvement in sustained attention and psychomotor speed among all the groups in pre, post and follow-up assessment. When the psychopathology decreased the attention also improved. This may be the reason behind this result.

Table 3 indicated the results of between group comparisons of Digit vigilance test. From the table it was found that there was no significant difference found among all the groups in pre and post assessment in terms of total time taken. But in the follow-up assessment it was found that significant difference among all the groups. When compared the mean rank of IMT group (5.20) with TAU group showed that experimental group took less time when compared to treatment as usual group. Post-hoc analysis indicated that more significance difference observed in IMT group. On the other hand, there were no significant difference found in pre assessment and significant difference seen in post and follow-up assessment in terms of total error made among all the groups. When compared from the mean ranks it was clear that IMT group made less error than treatment as usual group. Post hoc analysis showed that more significant change occurred in IMT group. From the overall analysis of Digit vigilance test it may be inferred that even IMT group was applicable in improving sustained attention and psychomotor speed in individuals with schizophrenia, more effectiveness shown in IMT group. These results were accordance with the findings of D'souza and colleagues (2012) and Thaut et al., (2009) who studied and examined the effect of both Cognitive retraining and music therapy

respectively in schizophrenic patients and concluded that both therapeutic approaches produce moderate improvements in attention and other executive functions.

From the above findings it can be concluded that instrumental music therapy along can represent a valid and without effects intervention for reducing symptoms severity and improvements of neuro-executive functions, specially Working memory, psycho-motor speed and sustained attention in individuals with schizophrenia and also for promoting the functional recovery. One of the striking findings of the present study was that those who received instrumental music therapy group observed more significant improvements in neuro-cognitive functioning. This finding suggestive that instrumental music therapy is applicable and very effective on neuro-cognitive functioning and symptoms severity in individuals with schizophrenia.

#### SUGGESTIONS FOR FURTHER RESEARCH

Based on the experience gained in conducting the present work, the following suggestions are put forth for further research in this area

1. The study may be replicated in a larger sample with inclusion of more number of participants satisfying the required criteria.
2. Different sub types of schizophrenia can be included for the comparative purpose.
3. Increasing the duration of instrumental music therapy and combining it with other social skills training program may improve overall functioning further.
4. IMT therapy can be applied in other disorders like depression, anxiety other neurological disorders.
5. More outcome measures can be included in future research which may give a broad idea.

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