Chapter 3

Method

The present study aimed at assessing the Cognitive Abilities in people with AUD and thereafter exploring the role of HACRT in improving the Cognitive Abilities among the sample. A pilot study was conducted to identify the variables that are to be explored. In the present research, the sample were assessed on their Cognitive Abilities and a suitable intervention module was developed by me, which was imparted to find its effectiveness in facilitating Cognitive Remediation, by comparing the pre and post treatment conditions.

Pilot Study

The pilot study was conducted at Kasthurba Gandhi Memorial Deaddiction Centre, Varadharajapuram, Coimbatore. Permission was sought from the administration after which the sample were briefed and data was collected using Informed Consent Form (Developed by the me), Personal Details Profile (Developed by me), NEO Five Factor Inventory (Costa & McCrae, 1992), Addenbrooke's Cognitive Examination - Revised (Mioshi et al., 2006) and Neuro-Functional Inventory (Kreutzer et al., 1999). The scores obtained on the Addenbrooke's Cognitive Examination-Revised Scale was analysed to identify the presence of cognitive deficits in people with AUD. The findings showed presence of increased deficits in areas of Fluency, Attention, Memory and Visuo-spatial Abilities. The personality characteristic of Neuroticism was high across the sample whereas Conscientiousness was low, Extraversion, Openness to Experience and Agreeableness were varied across the sample.

Operational Definitions

Alcohol Use Disorder

A condition characterized by over-use of alcohol for a period more than twelve months, involving dependence and tolerance, diagnosed by a clinical psychologist using the DSM-V

Demographic Factors

Biological, social, behavioural and economical attributes of the sample obtained in terms of Age, Education, Occupation, Income, Marital Status and Years of Drinking

Cognitive Ability

Ability/ abilities based on the performance of the brain and the efficiency of brain cells in sensing, perceiving and processing information, measured in people with AUD, to show the residual effects of alcohol on the cognitive functioning

Verbal Fluency

The ability to recall words when cued by an alphabet or sound on which the word or word sound begins, Eg. Letter ‘S’

Categorical Fluency

The ability to recall words when cued by a category to which the object/ living thing belongs, Eg. Birds

Attention

The ability to focus one’s efforts mentally and physically on a task based on the time taken to complete it, Eg. Trail-making Task (Part A)

Memory

The ability to recall information that has been stored in the working memory, tested by the Digit Forward and Digit Backward Tasks

Perceptual Speed

The ability to sense and respond to information from the external environment with quickness, tested using the Digit Letter Substitution Test (DLST)

Perceptual Accuracy

The ability to sense and respond to information from the external environment with accuracy, tested using the DLST

Reaction Time

The ability to respond or react to an external stimulus within a short span of time, tested by the Reaction Time Test

Fine-Motor Skills

The ability to perform minute tasks with high flexibility and sturdiness in grasping with fingers, tested by the Finger Dexterity Test

Holistic Art-based Cognitive Remediation Technique

A therapeutic module developed by me, with the purpose of enhancing Cognitive Abilities in people with AUD; the independent and relational effect of the three art forms viz. Colouring, Music and Story-Telling.

Colouring. A therapeutic activity where subjects are asked to crayon shade black outlines of figures for forty-eight days consecutively

Music. A therapeutic activity where subjects are subjected to hearing an audio track comprising of binaural beats and acoustic instrumental music for a length of 10 minutes 17 seconds for forty-eight consecutive days

Story-Telling. A therapeutic activity where subjects are presented with an image in a card form and asked to narrate a story related to the image for forty-eight consecutive days

Relational Effect. A therapeutic activity where subjects are presented with all three art activities for forty-eight consecutive days

Cognitive Remediation

Enhancement of Cognitive Abilities in people with AUD using the developed therapeutic module HACRT

Neuro-Behavioural Functioning

Functional level of the sample in terms of psychological, physiological, cognitive and emotional attributes, measured in people with AUD using the Neuro-Behavioural Functioning Inventory

Research Question

The study aims at answering the following questions

- What is the level of Cognitive Ability in people with AUD?
- Does the developed module have an effect on the Cognitive Abilities of people with AUD?
- Does the Neuro-Behavioural Functioning of people with AUD get enhanced after therapeutic intervention?
- Do the Demographic Factors have an influence on the Cognitive Abilities and Neuro-Behavioural Functioning of people with AUD?
- What are the Personality characteristics of people with AUD?

Objectives

The following are the objectives framed to answer the research questions

- To explore the Cognitive Abilities in people with AUD
- To explore the effectiveness of the developed therapeutic module (HACRT) in producing cognitive remediation in people with AUD
- To compare the effectiveness of the different art forms viz. Music, Colouring, Story-Telling and the relational effect of the different forms (HACRT) in producing Cognitive Remediation in people with AUD
- To assess the level of Neuro-Behavioural Functioning status of people with AUD
- To identify the effectiveness of the developed therapeutic module in enhancing the Neuro-Behavioural Functioning of people with AUD
- To compare the effectiveness of the different art forms in enhancing Neuro-Behavioural Functioning in people with AUD

Hypotheses

The following hypothesis have been framed to fulfill the above said objectives

- There exists a deficit in cognitive Abilities in people with AUD.
- The developed treatment module is effective in bringing about Cognitive Remediation.
- The relational effect of the different art forms is salient when compared to that of the independent art forms in bringing about Cognitive Remediation.
- There will be an impaired level of Neuro-Behavioural Functioning in people with AUD.
- There will be enhancement in the Neuro-Behavioural Functioning of people with AUD after the intervention.
- The relational effect of the different art forms is more effective in enhancing the Neuro-Behavioural Functioning in people with AUD.

Research Design

The study followed an experimental design of the pre-test, post-test and waitlist-control group model. The sample were pre-tested on the variables using the respective tools, after which they were randomized using lots into five different groups. These groups were treated for forty-eight consecutive days using the therapeutic module developed. The effect of the treatment was assessed to identify the improvement in Cognitive Abilities in people with AUD.

Sample

The sample were selected using incidental sampling technique. The sample group comprised of 155 males between the ages of 20-60 years. Data was collected from a private ‘De-Addiction Centre’ following the principles of AA in Madurai district, Tamil Nadu. The sample diagnosed with AUD by a clinical psychologist, undergoing standard de-addiction treatment were included in the study. Individuals in the post detoxification phase were considered for inclusion in the research, so as to avoid presence of hallucinations and other withdrawal symptoms.

Inclusion Criteria

Individuals diagnosed with AUD by a clinical psychologist

Individuals between the ages of 20-60 years

Individuals undergoing standard de-addiction treatment (AA)

Individuals in the post-detoxification phase

Exclusion Criteria

Individuals not diagnosed with AUD though users of alcohol

Individuals below 20 years and above 60 years of age

Individuals not undergoing any de-addiction treatment

Individuals in the detoxification phase

Individuals having other co-morbid psychological disorders

Individuals having other physiological diseases or disabilities

Variables

The variables of the study are as follows

Independent variables

The independent variable included in the study is the incidence of AUD, based on the diagnosis made by a Clinical Psychologist according to the criteria of the DSM-V.

Dependent Variables

Dependent variables included in the study involve the Cognitive Abilities of people with AUD, measured in terms of Verbal Fluency, Categorical Fluency, Attention, Working Memory, Fine Motor Skills, Reaction Time, Perceptual Speed and Perceptual Accuracy. Neuro-Behavioural Functioning was included as an additional dependent variable.

Tools

The tools employed in the collection of data include

Informed Consent Form

Informed Consent Form developed by me, providing a brief explanation of the purpose and procedure of the research, obtaining the consent of the participant to take part in the study.

Personal Details Profile

The Personal Details Profile developed by me, used to obtain data on the Demographic Factors of the participants such as Age, Education, Occupation, Marital Status, etc.

Controlled Oral Word Association Test

This test was developed by Hamster et al. in 1994 (sub-test of the Multilingual Aphasia Examination, 3rd edition), where individuals are asked to recall as many words as possible starting with a particular alphabet within 60 seconds duration. The test uses three trials with the most commonly used letters as F, A and S and if found difficult letters C and L are used. The test is found to have a high internal consistency of 0.83, test-retest reliability of 0.70 and inter-rater reliability of 0.99 (Tombough et al., 1999; Basso et al., 1999). The test shows a construct validity ranging between 0.44 to 0.87 and a high concurrent validity when compared to the Verbal Intelligence Quotient (Henry & Crawford, 2004).

Scoring. The total number of words recalled by the subject within the stipulated time in the all the trials is added and the average number of words recalled is calculated. This number is considered as the score for the Verbal Fluency of the subject.

Semantic Fluency Test

The Semantic or the Categorical Fluency Test is an extension of the Controlled Oral Word Association Test, wherein a category (eg. animals) is used instead of an alphabet to facilitate better fluency and recall. The subject is given three trials to recall as many objects/ living things falling within the particular category, 60 seconds provided for each trial. This test possesses good psychometric properties with a test-retest reliability of 0.70 (Harrison et al.,

2000). It has a construct validity ranging between 0.57 and 0.68 and concurrent validity showed ability of the test to differentiate between varying ranges of severity when compared to the Boston Naming Test (Henry & Crawford, 2004).

Scoring. The total number of words recalled by the subject within the stipulated time in the all the trials is added and the average number of words recalled is calculated. The number or words recalled is considered as the score for the Categorical Fluency of the subject.

Trail Making Task (Part-A)

This test was developed by Partington and Leiter in 1949 and was included as part of the Army Individual Test of General Ability in 1944 later incorporated in the Halstead-Reitan Battery (1958). Only part-A of the task was adopted for the present study where, the norms provided by the author (Reynolds, 2002) was followed. It involves connecting numbered circles from 1- 25 by drawing lines. The test has an internal consistency of above 0.70 (Reynolds, 2002), a test-retest reliability ranging from 0.70 to 0.78 and inter-rater reliability between 0.96 to 0.98 (Salthouse, 2011).

Scoring. The total time taken by the subject to complete the task is recorded in seconds to show the level of attention in the individual.

Digit Span Test

This test has been adapted from the fourth version of the Wechsler Adult Intelligence Scale (Wechsler, 2008) consisting of ten sub-tests. The Digit Span Test is a test of working memory where the individual is asked to recall immediately a list of numbers orally presented to them, first in the forward and then in the reverse direction. The length of the list is progressively increased to test the span of the individual's memory. The test has a high internal reliability ranging between 0.70 to 0.90 (Conway et al., 2005). The test also shows a good test-retest reliability ranging from 0.50 to 0.83 and a moderate criterion validity ranging between 0.48 and 0.52 when compared to the Stanford-Binet- IV Assessment of Intelligence (Wechsler, 1997).

Scoring. The number of correct trials recalled by the subject is considered the score of the working memory. The test is discontinued when the subject makes two consecutive wrong responses.

O'Connor Finger Dexterity Test

This test was developed by O'Connor in the year 1926. The tool comprises of a wooden board consisting of 100 holes arranged in rows and columns and provided with 300 metal pins of a length of 1 inch each. The subjects are asked to simultaneously insert three pins into each of the holes in any order as they desire. As the present study involved a clinical population, the subjects found it difficult to insert three pins into the holes and were hence asked to insert one pin into each hole. The test has a test-retest reliability between 0.71 and 0.86 and a high validity when compared to tools such as the Minnesota Manual Dexterity Test and the Functional Dexterity Test (Fleishman, 1953).

Scoring. The time taken to complete the task is recorded in seconds to determine the score on Fine Motor Skills. The test manual provides for a score converting the time taken to a numerical score, but the prescribed scoring system was not adopted for the present study as subjects were asked to place only one pin in each hole. Hence the time taken was recorded and considered a measure of the Fine Motor Skills instead of a score.

Digit Letter Substitution Test

The DLST was developed as an alternative to the Digit Symbol Substitution Test by Natu and Agarwal in 1995. This test consists of nine digits (1 to 9), each paired with an alphabet. The response sheet consists of fifteen columns and four rows. Under each digit, the subject is asked to substitute the corresponding letter as fast as possible, within an allotted time of 90 seconds. The test has a test-retest reliability ranging between 0.70 and 0.96 (Jutten et al., 2018). The test also has a high predictive validity and discriminant validity with d=1.3 (Benedict et al., 2017).

Scoring. The number of correct letters substituted is measured to show the Perceptual Speed. The Perceptual Accuracy is measured by the number of wrong substitutions, wherein a lower score indicates higher accuracy.

Reaction Time Test

I used a mobile application, an adaptation of the Simple Reaction Time Test of the California Computerised Assessment Package (CalCAP) - Standard Test Battery developed by Miller and Satz, where the test taker is asked to tap the screen as soon as they see a change on the

screen (Miller, 2011). It involves three trials, asking the subject to repeat the task. The test has a high internal reliability ranging between 0.77 and 0.96, test-retest reliability lies between 0.47 to 0.77 and convergent validity lies between 0.41 and 0.68 (Miller, 1995).

Scoring. The time taken by the subject to tap the screen in each trial is recorded in milliseconds, the average of which provides the Reaction Time score.

Neuro-Behavioural Functioning Inventory

The Neuro-behavioural Functional Inventory was developed by Kreutzer et al. in 1999. The tool consists of 76 items along a five point summative scale with never, rarely, sometimes, often and always as the options. The tool comprises of two forms, one to be filled by the patient and another to be filled by the informant, so as to correlate between the inputs. The present study used only the patient form as the subjects were at a residential treatment centre, staying away from their families. The test shows a high inter-rater reliability between the patient and informant forms and an internal consistency ranging between 0.86 and 0.95 (Kreutzer et al., 1999).

Scoring. The items are scored as never-1, rarely-2, sometimes-3, often-4 and always-5. The scores of the items are added to form the raw score which is converted into the standard score, percentiles and interpreted according to the norms provided by the author. The manual provides for different conversion tables based on the condition of the patient such as being unconscious for less than an hour, unconscious for more than an hour but less than fourteen hours and unconscious for more than fourteen days.

Development of the Therapeutic Module

Based on the review of past research and the effectiveness of Art Therapy in bringing about change, the idea of applying Art Therapy to produce Cognitive Remediation in the selected sample was hypothesized. Out of the numerous art forms used for therapeutic purposes, three art forms, viz Colouring, Music and Story-Telling were identified to enhance areas of Cognitive Abilities deficit in the sample. Through the review of past literature, it was postulated that Colouring would foster fine motor skills and working memory (Dzulkifli & Mustafar, 2013), Music would help in enhancing attention and perception (perceptual speed, perceptual accuracy and reaction time) (Sawami et al., 2018), Story-Telling would help in the betterment of fluency

(verbal and categorical fluency) (Conde et al., 2019) and the relational effect of the three art forms would produce a holistic remediation of the Cognitive Abilities.

Having arrived at the different art forms, discussions were carried out with subject experts in the field of alcohol de-addiction treatment. Taking into consideration the feasibility of application and other safety-related issues (as the sample are individuals prone to the abuse of addictive substances) the medium and materials for the execution of the therapeutic activities were adopted. Incorporating the specifications, I gathered and compiled the required materials to develop the therapeutic module, a colouring booklet, an audio track and pictures for Story-Telling.

The treatment period was planned for 48 consecutive days, based on the mandala concept of Ancient Indian medicine (Karthigayan, 2016). The compiled materials were reviewed by subject experts in the field of academics, alcohol de-addiction treatment, clinical psychologists, rehabilitation psychologists, psychiatrist and counselling psychologists. Based on the recommendations of the experts, appropriate modifications were made and the final module was compiled.

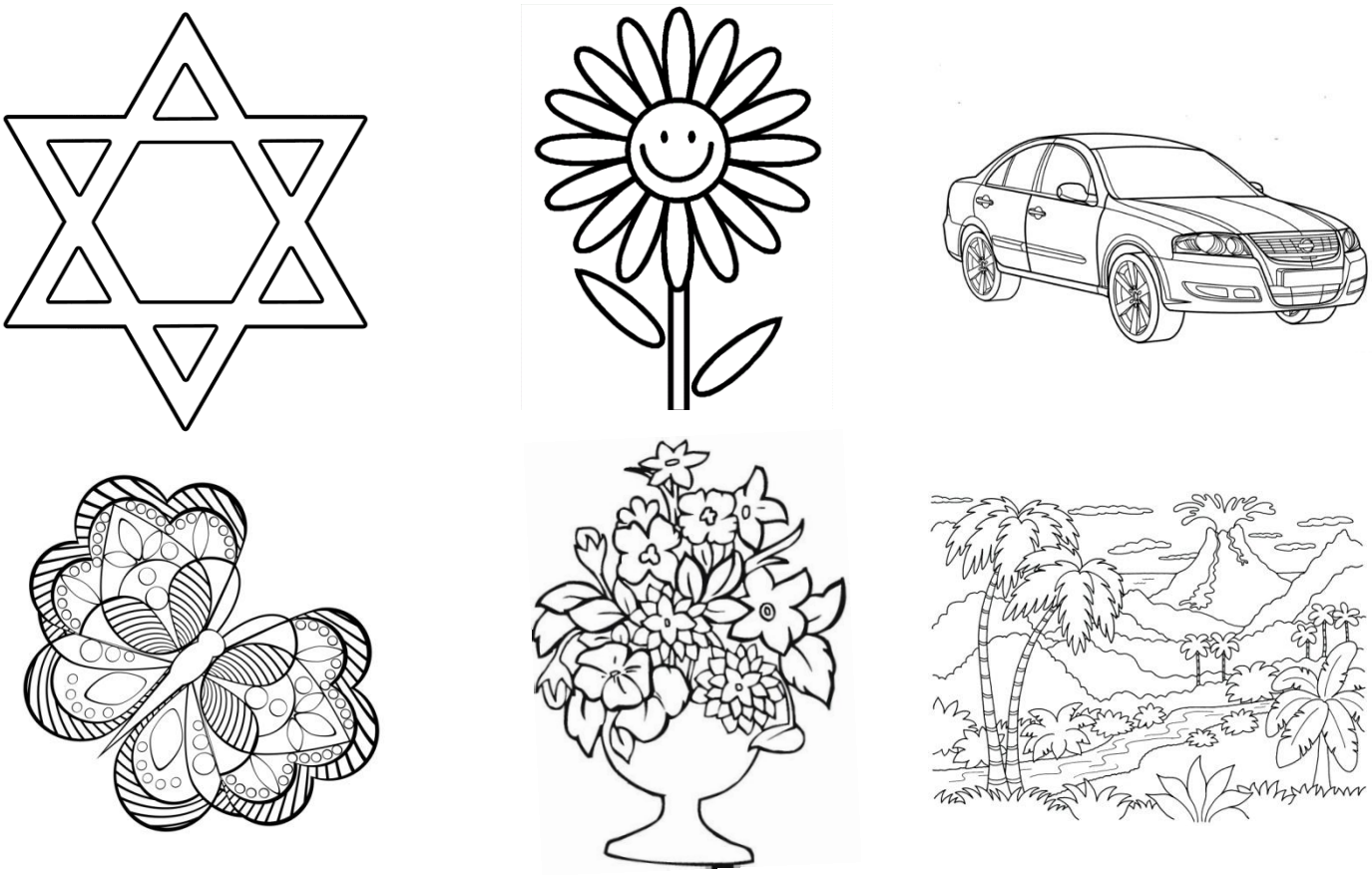
Description of the Therapeutic Module

The therapeutic module compiled by me, for the purpose of producing cognitive remediation, involving the art forms of Colouring, Music and Story-Telling is described as follows.

Colouring

Colouring involves crayon shading by the subjects, for which each subject is provided with a colouring booklet. As the sample comprises of a vulnerable group of individuals who are prone to abuse addictive substances, paints, pastels and colour pencils were avoided. Wax crayons being delicate for use by the mentally stressed sample group, plastic crayons were used as the colouring material. The colouring manual was compiled by me, providing a black outline of different figures seen in everyday life such as flowers, fruits, vegetables, transports and geometric shapes, in an increasing order of complexity. The least complex figure was one with more space and required the least number of colours whereas with increasing complexity the

figures involved more minute spacing and required the use of more number of colours, thereby demanding fine motor involvement. The book consists of forty-eight different figures, one figure to be shaded each day for forty-eight consecutive days.



Music

Music was presented in an audio form, a combination of binaural beats and acoustic instrumental music for a length of 10mins 17secs, to which the sample were subjected to hearing once every day for forty-eight consecutive days. The audio track involves an initial segment of binaural beats combined with instrumental music, a middle segment involving only instrumental music and a final segment combining binaural beats and instrumental music. Binaural beats in the present audio involves beep sounds every 0.5 seconds, which when resonating through the ears induces a trans-like state. There is a slight difference in the frequency of the sound delivered to each ear (For example, 200Hz and 205 Hz in each ear respectively) which when experienced

initiates an effect of differential frequency in the brain producing the desired therapeutic effect (Gonzalez, 2019). The initial segment includes binaural beats of differential frequency falling within the range of 30-45 Hz and in the latter segment of the frequency 14-30 Hz. The initial segment of frequency 30-45 Hz brings about cognitive enhancement through the peaking of awareness to higher cognitive capabilities of the individual. This is followed by instrumental music involving acoustics from a piano and guitar, which produces a relaxing effect. The latter segment continues with binaural beats of the frequency 14-30 Hz, enhancing focused attention, stimulating high-level cognition and analytical thinking (Padmanabhan et al., 2005). Instrumental music which when combined with the stimulating effect of the binaural beats enhances the overall benefit. The audio was extracted from an open source site so as to fulfill the requirements of the study with the help of a sound engineer.

Story-Telling

Story-Telling involved presentation of an image in a card form, as a visual cue to the subject, relating to which the subject had to narrate a story. One card was presented each day for forty-eight consecutive days. The images were selected so as to be non-invasive, not to remind the participants of any experience that relate to the addiction or the substance. Few images depicted abstract ideas which the subject had to interpret by his imagination whereas few images presented real-life situations of a positive nature. Both chromatic and achromatic images were used for the study. The images helped in laying a trajectory to the thought process of the participant and also to bring about homogeneity between the stories narrated. They were instructed to build the story so as to include live characters along a plot line with a clear beginning and ending. The following are a few images presented to the subject:

Procedure

Based on the outcomes of the pilot study, the variables and the respective tools for their assessment were identified. The compiled therapeutic module was reviewed by experts. Further modifications were made to incorporate the suggestions provided by the experts and the module set for usage. Several institutions which housed in-patients undergoing de-addiction treatment according to the principles of AA were contacted and requested for permission. Institutions following the AA method of treatment were specifically chosen as they house the patients for a minimum of three months, as the research required seeing the patients for a duration of 50 days and above. Owing to the practical difficulties in dealing with people with AUD and the requirement of seeing the participants on a regular basis, patients admitted into a residential treatment centre were chosen for the study. Based on the institutional approval and the viability

of conduction of the research, a private institution in Madurai district, Tamil Nadu was chosen for carrying out the research.

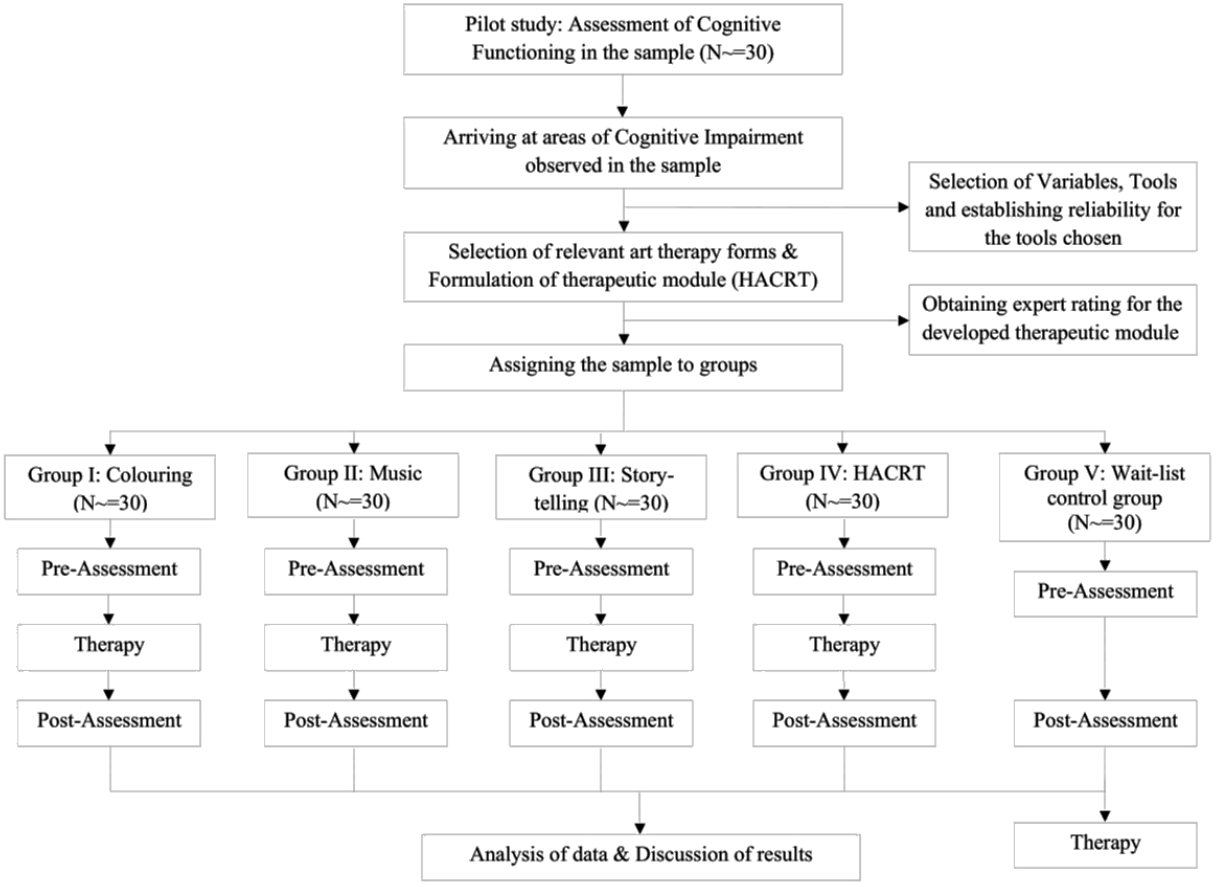
Amongst the patients in the de-addiction centre, individuals in the post-detoxification phase were chosen as the research participants. A total of 160 participants were chosen for the research. They were briefed about the research and informed consent was obtained in addition to the clearance obtained from the experts at the treatment centre. Participants were given the freedom of clarifying doubts at any point of time during the research and were free to leave the research if they wished to do so. Post briefing, they were assessed on their Cognitive Abilities using the identified tools.

The participants were then randomly assigned using lots to five different groups, group I assigned to Colouring, Group II to Music, Group III to Story-Telling, Group IV to a Holistic application including all three art forms and Group V as the Wait-list Control Group. After the pre-test assessment, the participants were exposed to the developed treatment module for 48 consecutive days, strictly under my supervision along with a psychologist from the centre, so as to avoid misuse of art materials and to also deal with any emotional disturbances in the participants. The post-test assessments were conducted, after which the wait-list control group was treated and the participants debriefed after the completion of the study. Data was then tabulated, coded and analysed to obtain the results.

Flow Chart

Figure 1

Procedure of the Study



Statistical Analysis

The data collected was tabulated, coded and analysed using the Statistical Package for Social Sciences-21. The data was assumed to be normal and hence parametric tests were used for analyses. The Cognitive Abilities and Neuro-Behavioural Functioning as an effect of the AUD was analysed using the Mean and Standard Deviation. The developed therapeutic module was tested for effectiveness using the Paired-sample t-test comparing the pre-test and post-test scores of the sample. An inter-comparison between the different therapeutic groups was performed using the one-way Analysis of Variance (ANOVA), furthered by the Duncan Post hoc analysis.