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Implementation Of Improvisational Music Therapy Among Children And Adolescents With Autism Spectrum Disorder In The Indian Context

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Abstract
Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterised by restricted and repetitive patterns of behaviour and is a pervasive developmental condition with severe impairments in the social and communication domains. Lack of vocalisations, social interest, eye contact, and presence of stereotypic behaviours may be present in the affected individuals. Treatment approaches for ASD include behavioural modalities including Music Therapy (MT) rather than pharmacological treatments. MT is an effective approach for ASD as music can act as an effective point of contact. The current research design employs cluster random sampling with 2 study groups: experimental group and control group. Biopsychosocial parameters such as hand grip strength, auditory reaction time, visual reaction time, cognition and social relationship & reciprocity are evaluated to see if there are any changes before and after the intervention period (6 months). The experimental group will undergo MT intervention using improvisational MT throughout the intervention period in addition to the regular school activities where as the controls will undergo only regular school activities. The data obtained before and after the intervention period will be statistically analysed in order to examine the differences between the study groups. The anticipated outcomes may contribute to the literature evidences with respect to the benefits of MT among children and adolescents with ASD especially in the Indian context filling the gaps present.

BACKGROUND AND LITERATURE EVIDENCES

Being a neurodevelopmental disorder manifesting persistent impairments in the social, communication and interaction aspects of early-onset nature, Autism is also characterised by restricted, and repetitive patterns of behaviour.[1] It is defined as a pervasive developmental condition with severe impairments in the social and communication domains.[2] The affected individuals also possess impairments in appreciation of social emotional cues of others, thus resulting in issues with social relationships and reciprocity.[3] The terms 'Autism Spectrum Disorder' (ASD) and 'Autism' are often used interchangeably and are characterised by varying degrees of impairments in social interaction, verbal & non-verbal communication and the presence of repetitive behaviours.[4] The DSM V has placed various disorders such as autistic disorder, Asperger syndrome, childhood disintegrative disorder and pervasive developmental disorder not otherwise specified (PDD NOS), under the diagnostic umbrella of ASD.[5]

Though the aetiology of ASD still remains unknown,[6,7] various aspects including genetic factors, environmental factors, prenatal paternal & maternal risks, natal in-utero risks, postnatal and perinatal events have been correlated as the aetiology of ASD.[8]

Lack of vocalizations, meaningful speech, social interest, pretend play, eye contact, finger pointing and joint attention are few of the many early symptoms manifested by children with ASD.[9] A wide range of stereotypic behaviours such as spinning (of objects and/or self), hand flapping, rocking, toe walking, hand gazing etc may also be present in this population.[10] More often, ASD is considered a psychiatric disorder though certain features are physical or systemic in nature among which is placed, muscle weakness.[11] In addition to this, research evidences have concluded that hand grip strength in individuals with ASD is reduced when compared to the controls.[12] Researchers have made use of instruments such as the digital hand grip dynamometer[13] and the Martin Vigorimeter[14] to measure the grip strength in individuals with

ASD. Apart from reduced muscle strength indicated by impairments in hand grip strength, research evidences also suggest that the auditory and visual reaction time are increased in individuals with ASD.[15] When it comes to the treatment modalities, there is need for long term support via specialized therapeutic interventions which are more expensive for ASD when compared to intellectual disability.[16] Majorly, behavioural intervention strategies are used, to the best of our knowledge, as there are no known cure or pharmacological treatments for this condition.[17] Considering that musical activities act as an effective point of contact between an autistic child and the therapist by way of creating rapport and enhanced learning,[18] Music Therapy (MT) can be utilized as an effective adjuvant therapy approach to make behavioural modifications in children and adolescents with ASD. 'Improvisational MT' broadly refers to the various interventional experiences in MT which rely on musical improvisation.[19] These techniques are being used globally with children and adolescents with ASD & has been proven to reduce symptom severity in the social affect domain.[20]

In Indian scenario, the effect of music listening vs playing of musical instruments & singing, in the social aspects of children with ASD were evaluated and it was observed that there were significant improvements in the social skills among the group of children who received the latter intervention approach.[21] When it comes to the acceptance of MT among the parents of children and adolescents with ASD in our country, research has proved that over 98% of parents were willing to try MT as a treatment approach for their child.[22] Early identification of the symptoms manifesting in the children is crucial in order to establish an early diagnosis leading to early intervention. Among parents of children with ASD in the Indian subcontinent, identification of the child's symptoms is said to be delayed by almost six to ten months when compared to the western counterparts which leads to further delay in referring the child to a professional.[10] In most early intervention settings, a multi-disciplinary approach is employed encompassing sensory integration, speech therapy, occupational therapy, behaviour modification and so on aiming to work with children up to the age of 5 years.[10]

There is a vast paucity when it comes to research involving the use of improvisational MT among children and adolescents with ASD aiming to improve various biopsychosocial parameters which are impaired. Specifically, there are no research studies which correlate the level of muscle strength with the severity of ASD in India to the best of our knowledge. A deficiency in research studies involving the use of improvisational MT with children and adolescents with ASD, specifically those which evaluate the effect of MT in hand grip strength, social emotional reciprocity and auditory & visual reaction time is widely present in the Indian context.

The Research Design

The Institutional Human Ethics Committee of Mahatma Gandhi Medical College and Research Institute provided approval (MGMCRI/2-24/RAC/02/IHEC/01) to conduct the research as of 26.2.2024. This study is also registered in the Clinical Trials Registry of India (CTRI) as of 25th of February 2025 (REF/2024/07/088950). This is a randomized controlled trial using cluster random sampling aiming to evaluate the effects of implementing improvisational MT on various biopsychosocial parameters (figure 1) such as hand grip strength, Auditory and Visual Reaction Time (ART & VRT), social relationship and reciprocity and cognition among children and adolescents with ASD.

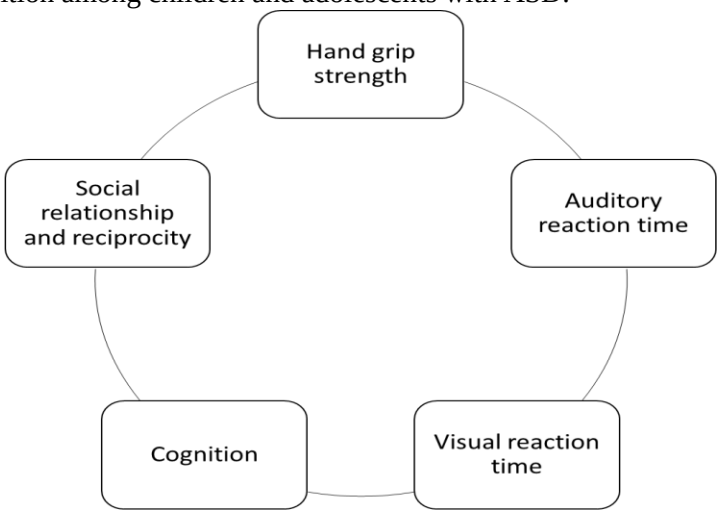

Figure 1: Parameters which will be evaluated before and after the intervention period

We also look forward to observing and assessing any changes in the severity of ASD in the participating children and adolescents due to the MT intervention which will be provided. The findings of the research will contribute to expanding literature evidence in the Indian context.

We thus broadly hypothesize that Improvisational MT influences the biopsychosocial parameters in children and adolescents with ASD.

The study will be conducted in five phases: phases 1 to 5. The structure of each phase is described in figure 2.

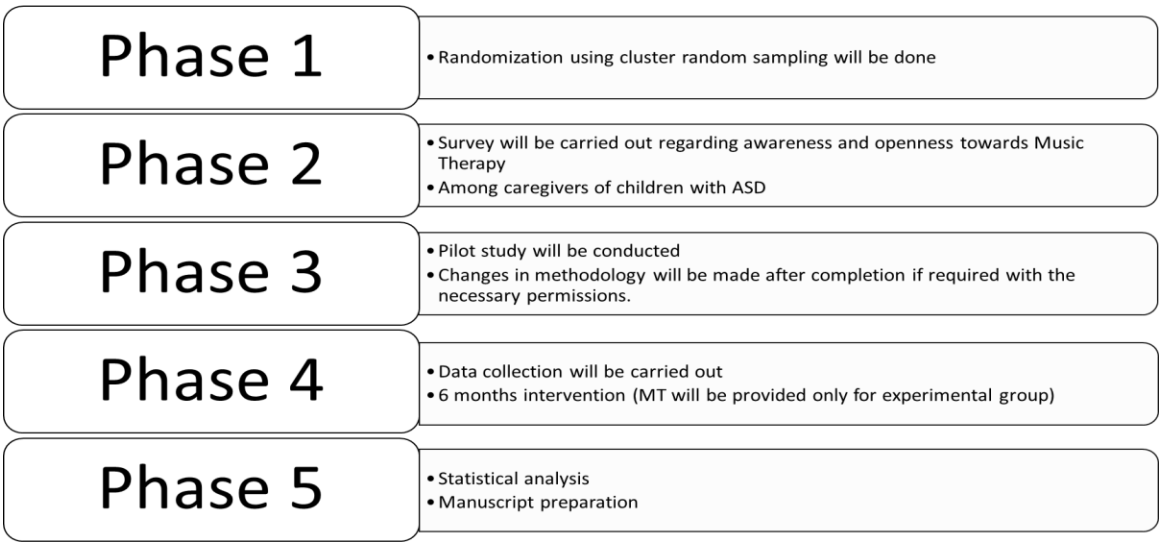

Figure 2: Phases of the research study

Participants

Children and adolescents with ASD between the age range of 6 to 18 years will be selected as participants for the research study. Recruitment will be based on pre-fixed 'inclusion' and 'exclusion' criteria. Those children and adolescents who are diagnosed with mild to severe levels of ASD – assessed using the Indian Scale for Assessment of Autism (ISAA), attending schools for children with special needs will be recruited. Whereas, those counterparts who have diagnosed comorbid medical conditions, visual and hearing impairments will not be recruited as study participants. The sample size for the study design will be calculated using statistical methods before the recruitment process.

The consort template which will be used for the research process is as given below (figure 3).

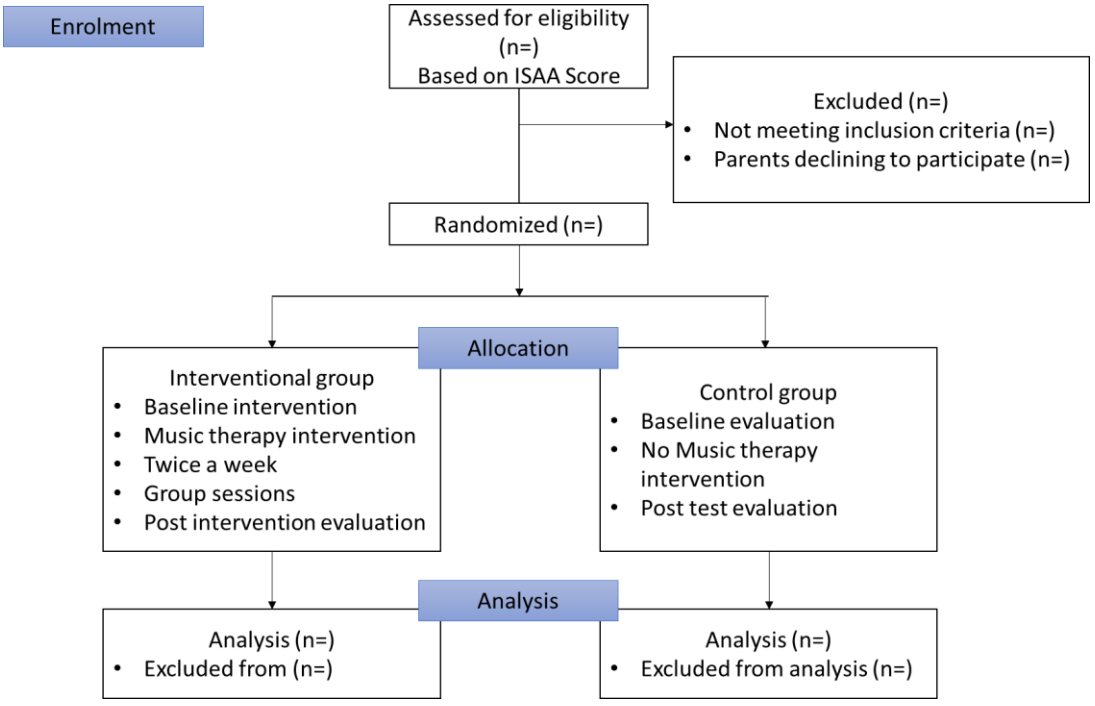

Figure 3: Consort

Consent procedure

The above-mentioned recruitment will be done only after the parents / caregivers provide an informed consent for their child to participate in the research study. Specifically prepared parent information sheets will be provided to the parents / legal guardians in addition to verbal explanations of the research process by the primary investigator in the native language. The parents / legal guardians are free to decline their child's participation or to withdraw the child's participation at any point of time after the recruitment process.

Phase 1 Sampling method

Total enumeration will be conducted to make a list of schools for children with special needs available in the Puducherry union territory of India. Different schools will be allocated to different study groups by implementing the Cluster Random Sampling method (figure 4). Among the totality, 4 schools will be randomly selected using the lottery method by an assigned quality control officer out of which 2 schools will be randomly assigned for the control group and the other 2 schools will be assigned for the intervention group.

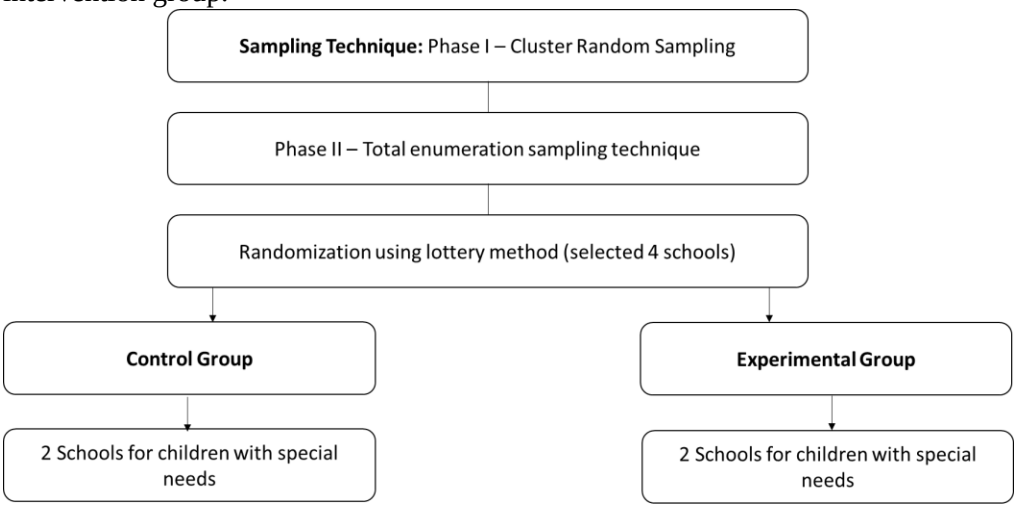

Figure 4: Cluster random sampling

Phase 2

A short survey will be conducted among the caregivers (parents and special educators) of children with ASD. The purpose of which is to evaluate the awareness levels regarding MT and openness towards the same.

Two separate questionnaires will be prepared by the primary investigator and will be reviewed by various stakeholders and experts of the field. The questions will be made in the regional language for better understanding.

Phase 3

Before conducting the data, a pilot study will be conducted using the same intervention techniques and assessment tools (as described in phase 4, but with reduced sample size) for a feasibility analysis. Any changes that will be required shall be incorporated with the necessary permissions from the research advisory committee.

Phase 4

Study groups

This Randomized Controlled Trial (RCT) will have two study groups: control and experimental groups. The participants in the control group will attend regular classes and other activities at their respective schools for children with special needs. Whereas, the participants in the experimental group will continue to attend the regular classes and activities similar to the control in addition to receiving MT intervention sessions twice a week for a period of 6 months.

Assessment tools

Data will be collected by the primary investigator using various methods of assessment such as the record review method, interviews, observations and test & measurements using instruments and study tools for the process. The school records will be reviewed by the primary investigator in order to have an understanding about the regular school activities of the participant. Interviews will be carried out among

the parents of the participants to administer the Indian Scale for Assessment of Autism and also to obtain the musical profile of the child / adolescent. Observations, tests and measurements will be carried out for three purposes: to observe the children/adolescents in various contexts to gain complete understanding of their needs & functional levels; to measure the hand grip strength and to evaluate the visual and auditory reaction time.

Indian Scale for Assessment of Autism (ISAA)

ISAA which is an objective assessment tool for persons with autism was developed by the National Institute for the Mentally Handicapped. The scale makes use of observations, clinical evaluation of behaviour, with information provided by both interaction with the subject and with the caretakers.

Digital Hand Dynamometer

A digital hand dynamometer manufactured by Prestige Grips will be used for measuring the hand grip strength of the participants. It is a musculoskeletal function test to measure the maximum isometric strength of the hand, specifically the forearm muscles.[23]

Reaction Time Apparatus

The reaction time apparatus manufactured by Anand agencies, Pune, India, will be used during this research to measure the ART & VRT. The apparatus is built with a 4-digit chronoscope and a display with an accuracy rate of 1 milli seconds. The instrument will be able to assess VRT for red and green lights, and the ART for the tone and click stimuli. Responses will be obtained for both right and left hands.[24] For the current research, the dominant hand of the participants will be used for the evaluation with 2 stimuli: red light for the VRT and tone for the ART.

Music Therapy intervention

Improvisational music therapy

Prof. Bruscia claims that, improvisation, in the MT context is inventive, spontaneous, extemporaneous, resourceful, involving creation and playing music simultaneously.[25] Improvisational MT is a broad term used to represent any MT experience using musical improvisation as the medium of assessment, treatment and / or evaluation.[19] Clinical improvisation techniques such as elicitation techniques, techniques of intimacy, techniques of empathy will be used aiming to improve the study parameters.

Repeating, modelling, making spaces and interjecting[26] are the few among the other elicitation techniques which will be used in the current research protocol aiming to increase the reaction tine component.

Techniques of intimacy in improvisational MT may be used to address the social relationship and reciprocity component as well as the cognitive skills. Sharing instruments, bonding and Soliloquies[26] are few techniques of intimacy which might be used in the current research.

Techniques of empathy is a strong tool for therapists to convey empathy directly by nonverbally matching or mirroring what the client is doing. The process not only serves to offer empathy but also to establish rapport with the client and to elicit their responses there by increasing interactions.[26] Theses techniques may aid in enhancing the social relationship and reciprocity aspects in the current research.

Music based activities

Structure music-based activities which engage both hands will be provided in the form of musical games to the participants. They will be aimed at enhancing the hand grip strength and there by aid in gross motor skills, fine motor skills and the executive functioning.

Warm-up techniques

Warm ups fall under group improvisation techniques and can be include a wide variety of musical experiences such as being musically active, receptive, vocalization, movement and / or relaxation practices.[27] Singing a ‘hello song’ and ‘good bye’ song at the beginning and end of the therapy session will give the participants a sense of routine and make them feel at ease. It may also aid in enhanced social relationship and reciprocity domains.

The Process

Baseline evaluations

Baseline evaluation will be carried out in both the study groups using the ISAA, digital hand dynamometer, the reaction time apparatus to assess the severity of ASD & the status of the biopsychosocial parameters as mentioned in figure 1 alongside the anthropometric measures. The evaluations will be carried out by the primary investigator by using the above-mentioned assessment tools by way of direct observations & interviewing the parents / caretakers. The obtained impressions will be monitored, reviewed and validated by the secondary investigator (corresponding author).

Intervention period

After the baseline evaluations, MT interventions will begin for the experimental group. The MT intervention will be provided by the primary investigator at the school premises for a period of 6 months, with 2 sessions a week (figure 5). The routine activities, special education and other therapies provided at the school premises will in no way be affected by the administration of the MT interventions.

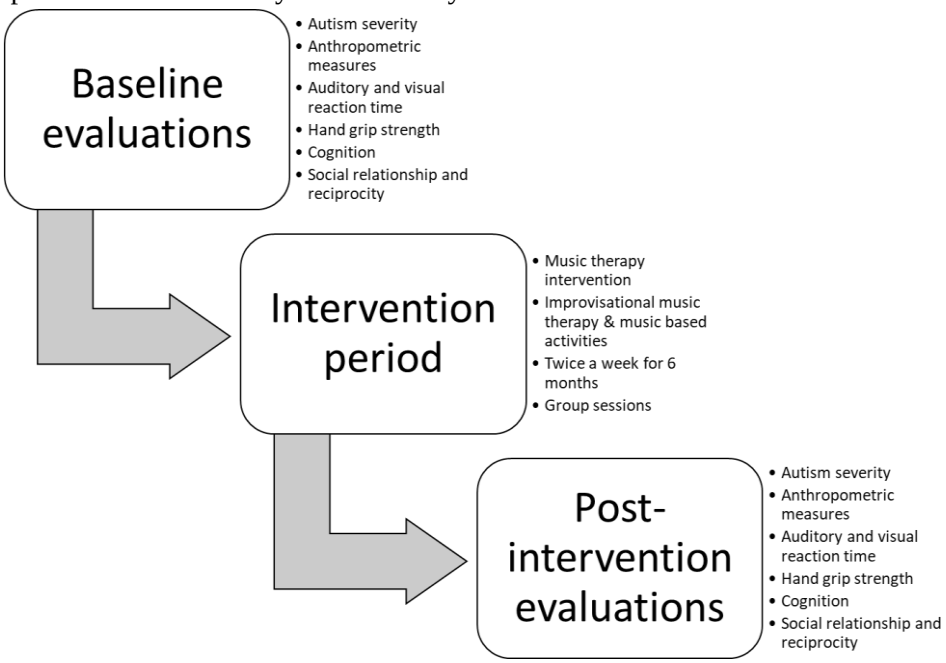

Figure 5: Experimental group

Each MT session will be for a duration of 40 minutes and will be provided as group sessions with a maximum of 10 students in a group. Each MT session will follow the structure as given below:

- 5 minutes – Warm up (hello song)
- 20 minutes – Improvisational MT techniques using percussion instruments
- 10 minutes - Music based activities
- 5 minutes – Warm up (goodbye song)

On the other hand, the control group (after baseline evaluations similar to the experimental group) will continue to receive the regular school activities, during the intervention period. They include: scholastics, speech therapy and occupational therapy.

Post intervention evaluations

After a period of 6 months (which is the intervention period), the same evaluations done during the baseline evaluation will be carried out as a post-intervention evaluation among both groups by the primary investigator, reviewed by the secondary investigator. The data obtained will be analysed using the Epidata Analyzer Software.

Expected Outcomes

The study aims to evaluate the effectiveness of improvisational music therapy on the biopsychosocial parameters mentioned in figure 1.

We hypothesize that there may be positive outcomes for the study as follows:

- increase in the hand grip strength which might contribute to enhanced executive functioning
- reduction in the visual and auditory reaction time
- enhanced social interactions and emotional reciprocity
- improved cognitive skills
- possible changes in the severity levels of ASD

The anticipated outcomes may contribute to the literature evidences with respect to the benefits of MT among children and adolescents with ASD especially in the Indian context filling the gaps present. It provides a direction for future researchers and also for other professionals working among this population. The importance of including MT as an integral part of the interdisciplinary team in the treatment of ASD is also being emphasized.

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