A Scientific and Systematic Evaluation of Neurologic Music Therapy as an Intervention Tool for Autism

by Anitha Ayyappan Pillai

PROJECT PROPOSAL FOR AIISH RESEARCH FUND

Part-A

1.0 Title of the project: A Scientific and Systematic Evaluation of Neurologic Music Therapy as an Intervention Tool for Autism

Area of research: Interdisciplinary

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1.4 Total grants required: INR 4,89,000 (Four lakhs eighty nine thousand Indian Rupees)

1.5 Duration of the project: 12 months

2.0 PROJECT SUMMARY

Autism is a complex neurodevelopmental disorder characterized by impairments in social interaction, communication, and restricted and repetitive behavior. Given the multisystem nature of this disorder, there is a clear need to develop multimodal interventions and therapeutic strategies that address the core deficits associated with it. Since music has a multisensory appeal, it can impact various human activities including communication, social-emotional response, and/or motor development. Neurologic music therapy (NMT), defined as the therapeutic application of music to cognitive, sensory, and motor dysfunctions arising from neurological disorders, deserves special mention in this regard. While conventional music therapy is focused within the social/emotional domains, NMT focuses directly on the physical effect of music and rhythm on neural networks. NMT is based on rational-scientific mediating model that utilizes Neuroscience principles to guide research in music therapy. The proposed study is aimed at assessing the potential role of NMT as a therapeutic intervention for autism, and a scientific and systematic evaluation of its efficacy. In addition to assessing the cognitive benefits of NMT, we also plan to examine the neurochemical (e.g. dopamine, β-endorphin and oxytocin) alterations resulting from NMT in the peripheral blood samples of participants. Outcome research on NMT in autism is in its infancy. There is a gap between the theoretical understanding of potential role of NMT, and scientific and systematic evaluation of its efficacy.

3.0 INTRODUCTION

3.1 Definition of the problem

Autism is a complex neurobehavioral disorder characterized by impairments in social interaction and developmental language and communication skills combined with rigid, repetitive behaviors. Over the past 20 years, several therapeutic approaches have been proposed to improve the symptoms associated with autism. These include pharmacological therapies and various complementary therapies including diet modifications, vitamin therapy, occupational therapy, speech and language therapy and behavioral and developmental interventions (Volkmar et al, 2005).

As autism is a multisystem developmental disorder, there is a clear need to develop multisystem interventions that address the core deficits of this disorder, as well as the perceptuo-motor and behavioral comorbidities. Since music is known to evoke multisensory stimulation, it could impact various activities including communication, social-emotional, motor development, sensory-perceptual and behavior (Srinivasan and Bhat, 2013). Music processing is distributed throughout the brain and involves nearly every neural subsystem (Parsons, 2001). Due to the multimodal, multisystem nature of music, multiple brain regions, including motor, perceptual, language and social-emotional systems are stimulated during musical experiences. Musical training may help to address the core autism impairments in joint attention, social reciprocity, and non-verbal and verbal communication, as well as comorbidities of atypical multisensory

perception, poor motor performance, and behavioral problems. Children with autism find musical activities enjoyable, perhaps due to their enhanced musical understanding. Therefore, clinicians and special educators often use music-based activities in school settings to engage children with autism. Furthermore, music-based activities can be non-intimidating since the affected individuals spontaneously explore various musical instruments, with the trainer joining in. Since children with autism have difficulties with direct social engagement, socially embedded group musical activities provide excellent opportunities to engage in predictable and comfortable interactions with social partners (LaGasse, 2014). Approximately 12% of all autism interventions and 45% of all alternative treatment strategies in schools involve music-based activities. (Srinivasan and Bhat, 2013). Music intervention has been reported to improve social behaviors, to increase focus, attention and communication attempts (vocalizations, verbalizations, gestures, and vocabulary), to reduce anxiety, and to improve body awareness and coordination in autistic individuals (Whipple, 2004; Geretsegger et al, 2015).

Conventional music therapy is usually focused within the social and/or emotional domain. Recent developments in the field of Neuroscience have lead to the development of a scientific approach to music therapy practice and research, termed as the neurologic music therapy (NMT). NMT is defined as the therapeutic application of music to cognitive, sensory, and motor dysfunctions arising from a neurological disorder (de l'Etoile, 2010). NMT is based on rational-scientific mediating model (R-SMM), which is a systematic framework that utilizes Neuroscience principles to guide research in music therapy, providing a link between basic and applied research. This is expected to provide a scientific foundation for clinical interventions. NMT techniques have been designed to address 3 areas of functioning, (i) sensorimotor functioning aimed at rehabilitating motor functions, mobility, strength, endurance, cadence, and co-ordination of gross and fine motor movements, (ii) speech and language functioning aimed at rehabilitating vocal control, speech production, and meaningful usage of verbal and non-verbal symbols in communication, and (iii) cognitive functioning aimed at rehabilitating basic and higher order cognitive functions such as attention, memory, executive functions, and psychosocial skills (Thaut 2005a,b,c).

Outcome research on NMT in autism is in its infancy. The aim of this proposal is to develop NMT as an effective, valid, and reliable intervention for the treatment, management and habilitation of autistic individuals. Since music has been found to stimulate the release of several neurochemicals, we plan to examine any alteration in the levels of dopamine, β-endorphin and oxytocin in the peripheral blood samples of participants (treatment group and control group).

3.2 Objectives

I. To monitor the cognitive benefits associated with NMT in autism
II. To compare the peripheral blood levels of dopamine, β-endorphin and oxytocin between NMT treatment group and control group
III. To develop NMT as an intervention for autism, where it could compliment ongoing treatment procedures

3.3 Review of status of research and development in the subject

Outcome research on NMT-based therapy for autism is in its infancy. There is a gap between the theoretical understanding of potential role of NMT, and scientific and systematic evaluation of its efficacy.

3.4 International and National status

International status

There are several reports on conventional music therapy in autism (Srinivasan and Bhat, 2013; Gebauer et al, 2014; LaGasse, 2014; Geretsegger et al, 2015; Vaiouli et al, 2015), but very few reports on NMT in autism (Hardy and LaGasse, 2013). Most of these studies, focused mainly on communication outcome, were pre- and post- comparison of outcome in the treatment group without involving a control group. Further, the sample size was small in several of these studies.

A scientific evaluation of the cognitive benefits of NMT in autism has not yet been carried out.
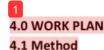
National status

National Brain Research Centre (NBRC), Haryana is conducting an internet-based study wherein participants will listen to different Hindustani raga excerpts and rate the extent to which various emotions are evoked by the ragas. Their findings have provided new insights into the emotional response evoked by Indian ragas, and the impact of tempo, rhythmic regularity and tonality (Mathur et al, 2015). NBRC is also carrying out a functional MRI (fMRI) study to elucidate the neural network of emotion perception. In this study, functional fronto-temporal connectivity, disrupted during spoken-word perception, was found to be preserved during sung-word listening in autism, suggesting alternate mechanisms of speech and music processing in autism (Sharda et al, 2015).

3.5 Importance of the proposed project in the context of current status

In the absence of documented studies in the area of proposed project, we feel that the present study can reveal valuable information on the scientific aspects of NMT in autism, thereby improving its therapeutic potential.

4.0 WORK PLAN
4.1 Method
Subjects/Participants

The subjects/participants will be recruited from among the autism patients (verbal and non-verbal) attending ICCONS Hospital, Shoranur. Diagnosis for autism is done on the basis of DSM-IV-TR, and severity rating using Childhood Autism Rating Scale (CARS). We will enroll 30 autism patients for NMT, who will also undergo a standard treatment plan, and an equal number of age- and gender- matched autism patients as control group who will undergo only the standard treatment plan without NMT. The participants will be below the age of 10 years.

Material

NMT protocol will be developed with the help of an experienced music teacher. Efficacy of NMT will be assessed using individualized music therapy assessment profile (IMTAP) and standard assessment tools [e.g. CARS; Behavior Rating Instrument for Autistic and Atypical Children (BRIAAC)]. ELISA technique will be used to monitor the neurochemical changes associated with NMT in peripheral blood samples.

Procedure

A suitable NMT protocol will be developed for the participants with the help of an experienced music teacher. Music will be presented free-field to all the participants. The elements of NMT would be as follows,

I.   Language and communication (singing, chanting, playing musical instruments such as violin and veena)

II. Social-emotional development and behavior (music making or singing in group settings, synchronous movements during rhythmic actions, musical games)

III. Gross and fine motor skills (whole body rhythmic actions such as clapping, marching or walking to music, synchronization of arm and body movements to the rhythm of music, playing musical instruments, music and movement games)

Individual as well as group therapy sessions will be incorporated in the protocol. Therapy sessions will be provided 3 times per week. There will be no home training. When NMT is being administered, the control group will be given structured activities for an equal amount of time.

Efficacy of NMT will be examined using IMTAP and standard assessment tools such as CARS and BRIAAC. IMTAP is an in-depth assessment protocol developed by expert music therapists. This provides assessment of 10 main domains (gross motor skills, fine motor skills, oral motor skills, sensory skills, receptive communication/auditory perception, expressive communication, cognitive skills, emotional skills, social skills, musicality) and several sub-domains, together providing a systematic profile of 375 skills.

ELISA technique will be used to compare the peripheral blood levels of dopamine, β-endorphin and oxytocin between the treatment and control groups.

Analyses

Analysis involves pre- and post- comparison of the outcome in treatment group and control group.

6.0 IMPLICATIONS OF THE RESULTS OF THE STUDY

a. Presentation of scientific papers in professional seminars / publication of articles
- Research findings will be published in reputed journals
- The findings will be presented in national and international conferences so that it reaches the scientific community

b. Discussion with professionals
- The implications of the study will be discussed with professionals from medical and paramedical fields in order to develop it as an intervention strategy
- Awareness programs will be conducted to discuss the implications of the study with parents and general public

c. To utilize the results in the development of remediation
- An intervention protocol making use of NMT will be developed to complement the ongoing treatment/management protocols

7.0 UTILIZATION OF RESULTS OF THE STUDY

We aim to develop NMT as an effective, valid, and reliable intervention for the treatment, management and rehabilitation of autistic individuals.

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PRIMARY SOURCES

1	www.aiishmysore.in Internet Source	3%
2	journal.frontiersin.org Internet Source	2%
3	Hald, Søren V., Felicity A. Baker, and Hanne Mette Ridder. "A preliminary evaluation of the interpersonal music-communication competence scales", Nordic Journal of Music Therapy, 2015. Publication	2%
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