

Neuro-Psycho-Social Rehabilitation for Elderly Patients: Multimodal Approach with Indian Music (Feasibility Study)

Ruma Chakravarty, Music Therapist and Leadership Executive Coach at
Factorize & SurManjari, Faridabad, India

Jaideep Chakravarty, Independent Yoga Instructor & Consultant,
Faridabad, India.

ABSTRACT:

Neuro-psycho-social rehabilitation of elderly patients with Indian music is an area that is growing steadily in India. Music is accepted well by the elderly patients and at the same time music can be targeted to address, improve and restore various elderly conditions that affect the functional, psychological and social health of the elderly patients. The paper examines the feasibility of using multimodal approach with Indian music for neuro-psycho-social rehabilitation of disease-specific symptoms of two elderly patients - one having Alzheimer's disease (AD) and the other having rheumatoid arthritis (RA), through longitudinal case studies. Both the studies were conducted in non-hospital set-ups. For both the cases, only qualitative observations were noted. Secondly, this paper discusses the feasibility of conducting next phase of experimental work (evidence-based research) for the rheumatoid arthritis patient from the qualitative outcome and that is to examine the effect of multimodal approach with Indian music for the patient's desired outcome, which is improvement in walking (gait improvement).

KEYWORDS: *rehabilitation, music therapy, multimodal approach, multimodal rehabilitation approach, Indian music therapy, Indian music intervention, Alzheimer's disease, rheumatoid arthritis, elderly patients, Yoga, Yogasana with music, visual cues with music, stories with music.*

OBJECTIVE:

Objective of the two longitudinal case studies is to qualitatively examine the rehabilitative impact of multimodal approach with Indian music on two patients – one having Alzheimer's disease and the other having rheumatoid arthritis so as to restore some of their neuro-psycho-social balance. And secondly, to analyze this qualitative observation to fathom the feasibility of experimental research through multimodal

approach with Indian music for the desired outcome of rheumatoid arthritis patient and that is gait improvement or improvement of posture while walking.

SUBJECT:

One female patient of age 65 having Alzheimer's disease and another female patient of age 67 having established rheumatoid arthritis. For the patient with Alzheimer's disease, the study was conducted in the patient's residence in Faridabad while for the patient with rheumatoid arthritis the study was conducted at the Senior Citizen Home, Faridabad where she is presently residing.

INTRODUCTION:

High growth rate of elderly population in India (even higher than the growth rate of general population as per a Report "Elderly in India, 2016"¹ by Ministry of Statistics & Programme Implementation) demands sustainable and better quality elderly health care. This is a global trend as reported by World Health Organization (WHO) in their February, 2018 fact sheet "Ageing and health".² The elderly in the urban areas need more care than those living in villages primarily due to lifestyle differences between the two set-ups. As mentioned in the book *Music Therapy with Indian Music (Essentials & Sources) – Volume 1, "Old age comes with 3Ds - Disorders, Diseases and Disabilities. And these 3Ds physically, psychologically and functionally drain the elderly and force them to withdraw from societal activities many times"*.¹¹ There are various diseases including autoimmune, Alzheimer's, Parkinson's, depression and others that require integrated and multimodal methodologies for their management in conjunction with medication. Moreover, some disorders/ conditions do not have any targeted medication and for those only a few disease modifying medicines are available for some condition prevention. Alzheimer's disease (a form of dementia) and rheumatoid arthritis fall under this category where only a few disease modifying medicines are available. The report "Elderly in India, 2016" also mentions locomotor disability as one of the most common disabilities as per Census 2011; and women, more than men suffer from problem of joints.¹ Secondly, as per "alz.org", India, over 4 million people have some form of dementia³ while this might reach 7.5 million as per "The Dementia India Report 2010"⁴. As noted by arthritis-india, arthritis affects 15% people in India. This prevalence is higher than many other diseases such as diabetes, AIDS (AIDS stands for Acquired Immunodeficiency Syndrome) and cancer. There are over 100 rheumatological disorders classified by World Health Organization (WHO).⁵

Separate researches for the two conditions Alzheimer's disease and rheumatoid arthritis have found some common aspects. People with rheumatoid arthritis suffer from psychological glitches due to functional or movement disabilities, hampered motor skills (both fine and gross), pain and other challenges and feel their existential values are diminishing by the day. This increases with the disease progression and they become depressed, anxious, hyper, irritable, withdraw from the social participations and lead a reduced quality life. For patients with Alzheimer's disease, their restricted functional skills, neurological disorders, psychosomatic imbalance results in poor quality of living, social rejection, cognitive impairment and other conditions. In both cases, the normal functioning of life suffers to a great extent.

Increasing incidences of these conditions that force the affected population to lead a life that they do not deserve, need care through therapies/ rehabilitation modes that are natural, efficacious, scientific, interactive and engaging so that they can regain the confidence to accept themselves, value their lives, become social and lead a better quality and decent life.

Music therapy is a well-accepted measure that has proven its effectiveness in improving various symptoms and sustaining the improvement of the symptoms related to conditions that interfere with the psychosomatic balance, neuro health and social status of elderly. Music therapy aims at helping the elderly patients having diseases such as Alzheimer's disease and rheumatoid arthritis to recover from disabilities and to give them confidence in socializing, taking part in activities and be in an accepting state of mind. Many researches (both qualitative and quantitative) are being carried out worldwide with music intervention especially for Alzheimer's disease and also for few symptoms of rheumatoid arthritis which reveal positive outcomes.

LITERATURE REVIEW:

For this paper, the literature review is done to support the feasibility of using multimodal approach with Indian music for managing symptoms of two patients having diverse conditions (one with Alzheimer's disease and the other with rheumatoid arthritis) in order to rehabilitate and establish some balance in their functional, psychological and social aspects.

Indian music has an age old tradition that dates back to Vedic era. Nadopasana and Nadanusandhana through Indian classical music have their roots to Nada Yoga. These inclusive practices were essential components of our ancestors' regular life. Lyrical music, instrumental music, movements with music involving different body parts while singing were essential features of Indian music forms during ancient

times.¹² These are the very techniques that are being used in our music therapy and music intervention approaches today for healing as well as for rehabilitation of patients having different illness.

Vedic Mantras are found to be very powerful tools for enhancing brain function and for improving brain structure associated with cognition etc. One of the studies conducted by the researchers of DM Wayanad Institute of Medical Sciences, Kerela found that there was a significant increase in both spatial and verbal memory scores by chanting Gayatri Mantra.⁶

Our very old traditional music Kirtans are found to boost memory. Researchers from West Virginia University School of Public Health, University of Virginia Health System, University of New Mexico School of Medicine and Alzheimer's Research and Prevention Foundation found that Kirtan Kriya with visualization and various mudras (including music listening) was acceptable and beneficial for adults who are at risk of memory loss in future.⁷

Instrumental music therapy and singing were found to alleviate pain and improve the pain conditions. In effect, this improves the physical and psychological conditions of the patients. The research was conducted by researchers of Kobe University Graduate School of Medicine, Kobe, Kakogawa City Hospital, Kakogawa and International University of Health and Welfare, Tokyo, Japan.⁸

Another interesting research by researchers from Wake Forest School of Medicine and University of North Carolina has found that listening to preferred music affects functional connectivity in regions involved in self-referential thought and memory encoding, such as the default mode network and the hippocampus, supporting the brain functions like connecting to one's own thoughts, empathy and levels of self-awareness.⁹

Why multimodal approach with Indian music for Neuro-Psycho-Social rehabilitation of patients with Alzheimer's disease and rheumatoid arthritis

For this study, the model of multimodal therapy/ rehabilitation approach with Indian music (fig 1 below) developed by SurManjari, Faridabad was used. There are various activities involved in the multimodal rehabilitation approach. For the two longitudinal case studies, we have employed modalities as per suitability of the condition of elderly patients. The reason for choosing the multimodal approach was to effectively employ music therapy so that:

1. The patients connect to the activities of their choice with music and other modalities so that they can personalize the process, connect to the good memories and become self-aware; at the same time, they are motivated to participate in the therapy process and be engaged.
2. The proven ancient practices like Mantra chanting, Yoga or Meditation can expedite the rehabilitation process when used with Indian music, melody and rhythm. As Mantras are wonderful tools for memory boosting, Yoga offers many advantages for a better physical wellbeing and mental health, which was very important for the patient having rheumatoid arthritis for doing the base work for her long term desired outcome.

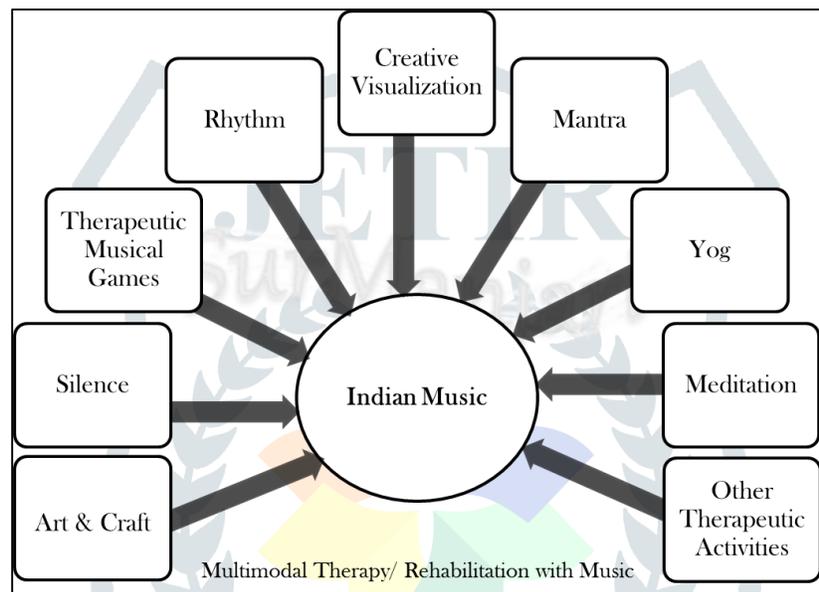


Fig 1: Multimodal therapy/ rehabilitation approach with

Indian music [from SurManjari]; fig from “Music Therapy with Indian Music (Essentials & Sources) – Volume 1”

3. They not only passively participate but are active in the therapeutic process with the appropriately designed intervention in order to improve their motor, somatic and psychological health.

PHASES OF CASE STUDIES PRESENTED:

- Initial evaluation
- Defining objective of the study in phases
- Selecting tools for designing multimodal rehabilitation approach with Indian music
- Designing multimodal rehabilitation approach
- Administration
 - Methods
 - Duration

- Defining method of assessment/ observation
- Analysis and outcome

CASE STUDIES:

CASE STUDY 1 - ALZHEIMER'S DISEASE:

Case Study 1 - Initial evaluation:

Name: ABC

Gender: Female

Age: 65

Disease/ Disorder/ Condition: Alzheimer's disease

Medication: Doctor prescribed nerve calming medicines when the multimodal rehabilitation process with music intervention started

Other Therapies: None

Multimodal Intervention Start Date: December 2009

“Alzheimer's disease (AD) is a type of dementia that causes problems with memory, thinking and behavior. Symptoms usually develop slowly and get worse over time, becoming severe enough to interfere with daily tasks. Alzheimer's is the most common cause of dementia, a general term for memory loss and other cognitive abilities. Alzheimer's disease accounts for 60 percent to 80 percent of dementia cases. Alzheimer's worsens over time. Alzheimer's is a progressive disease, where dementia symptoms gradually worsen over a number of years. In its early stages, memory loss is mild, but with late-stage Alzheimer's, individuals lose the ability to carry on a conversation and respond to their environment.”³

Few pointers (only condition related) from initial evaluation of the patient:

- ABC started developing the severe symptoms of the condition during 2005 (as told by the family members)
- Lost most of her memories
- Was not able to register events
- Would not recognize family members

- Lost the sense of time, day or night
- Her abilities to do daily activities were severely hampered
- Would go out and be lost
- Her cognitive functions, thinking, spatial orientation and reasoning were lost
- She suffered from personality and behavioral disorientation
- At times she would be extremely violent
- Was tremendously restless
- She was having prescribed nerve-calming medicines

As per the initial observations, the rehabilitation approach needed to be designed and administered in phases because it was not feasible to manage or handle all symptoms simultaneously. Thus, primary symptoms were targeted in **Phase 1** of rehabilitation process for her psychological (and functional as secondary outcome objective) wellbeing.

Case Study 1 - Phase 1:

- *Case Study 1 - Objective - Phase 1:*

Primary objective was to examine the effect of multiple modalities with Indian music on management of the violent streaks and restlessness of the patient. It was mandatory to address these two symptoms in order to work on others.

- *Case Study 1 - Tools used in Multimodal Rehabilitation Approach with Indian Music – Phase 1:*

Pre-therapy assessment or initial evaluation (with family members) revealed that she could remember a few songs that she heard when she did not develop Alzheimer's disease. This was recounted by the family members since as per them she would listen to only those songs calmly and would be restless as soon as others are played. Among the songs she responded to (as noted from her family members), one was a Sarswati Vandana based on Purvi Raag that she would listen to most attentively. This means that the musical memory was retained as neurally encoded musical experience for her. This was encouraging as there was possibility that she might respond to music intervention and other associated modalities.

The above information formed the basis of designing the rehabilitation approach for **Phase 1**. Musical elements/ tools/ modalities used were as follows:

Music	Musical Elements/ Tools/ Modalities
Raag	<ul style="list-style-type: none"> • Purvi
Elements of Raag	<ul style="list-style-type: none"> • Alaap • Vistaar • Alankars
Songs	<ul style="list-style-type: none"> • Sarswati vandana • Other songs she responded to
Others	<ul style="list-style-type: none"> • Omkara chanting
Others	
Visual cues	<ul style="list-style-type: none"> • Old family photos
Administration mode	<ul style="list-style-type: none"> • Vocal • Visual

Table 1: Elements/ tools/ modalities for Phase 1 of intervention for AD patient

• **Case Study 1 - Designing Multimodal Rehabilitation Approach – Phase 1:**

The multimodal approach with Indian music as the base was designed considering the initial evaluation, objective for this phase and with all modalities mentions in the table above. Variations in rendition, music playing as well as in employing visual cues were decided by the music therapist as appropriate.

• **Case Study 1 - Administration – Phase 1:**

○ **Methods**

- Predominantly receptive/ passive music intervention was administered since she was not in a position to sing/ render or take part in activities
- Omkara chanting was played (by family members)

- Old family photos were shown to her. These were used as visual stimuli primarily as memory boosting aid while the familiar music was played
- **Duration**
 - Music intervention (vocal) was given 4 days a week, one session a day, for at least half an hour per session. Thus, 4 sessions per week were conducted.
 - Old family photos were shown for 5 minutes each session with music, 4 days a week
 - Omkara chanting was played at least 4 days a week for 15 minutes during morning and evening each (by family members)
 - The rehabilitation process in **Phase 1** continued for 12 months
- **Case Study 1 - Method of Assessment /Observation – All Phases:**

In this longitudinal study, qualitative observations were recorded as follows:

- Session feedback in the form of notes for each sessions and of repeat administration were taken
- Video recordings for sessions in regular intervals were done
- Feedback from family members was taken to cross-check those with the observations of the music therapist.

- **Case Study 1 - Outcome – Phase 1:**

The observation through session feedback, video recording and feedback from the family members were collated, compared, reviewed and analyzed carefully every week to infer the following overall qualitative outcome:

- **Changes Observed**
 - Her restlessness was controlled to a great extent
 - Her violent streaks too reduced quite a bit
 - She stopped going out alone completely

○ **Changes Not Observed**

- She still struggled with memory
- Was not able to get better in registering the day to day events and thus needed help to guide her
- She was not able to read the time of the day
- She rarely followed instructions to do her daily tasks
- Her prescribed nerve calming medication continued

Case Study 1 - Phase 2:

• **Case Study 1 - Objective - Phase 2:**

As per the Phase 1 outcome, there were progresses seen in managing both the violent streaks and restlessness of the AD patient to some good extent, which also was the primary objective of the longitudinal study through multimodal rehabilitation approach with Indian music. However, these improvements did not affect other symptoms of the Alzheimer's patient that we can consider as secondary outcome.

Hence **objective** for **Phase 2** was to examine whether the multimodal approach with Indian music was efficacious in managing her abilities to do daily activities, her memory boosting and on the re-orientation of her behavior to improve functional and social abilities.

• **Case Study 1 - Tools used in Multimodal Rehabilitation Approach with Indian Music – Phase 2:**

Some additional tools/ modalities were used for the intervention in **Phase 2**

Music	Musical Elements/ Tools/ Modalities
Raag	<ul style="list-style-type: none"> • Purvi • Bhupali
Elements of Raag	<ul style="list-style-type: none"> • Alaap • Vistaar • Alankars • Taans

Songs	<ul style="list-style-type: none"> • Sarswati vandana • Other songs she responded to • Rabindra sangeet (Tagore Songs)
Others	<ul style="list-style-type: none"> • Omkara chanting • Mantras
Rhythm	<ul style="list-style-type: none"> • Different Taalas to introduce rhythmic patterns as demanded by the music rendered
Others	
Visual cues	<ul style="list-style-type: none"> • Old family photos
Narration of stories of her old events accompanied by music of her known songs	<ul style="list-style-type: none"> • Related visual cues like <ul style="list-style-type: none"> ○ Souvenirs ○ Other things
Administration mode	<ul style="list-style-type: none"> • Vocal • Instrumental • Visual

Table 2: Elements/ tools/ modalities for Phase 2 of intervention for AD patient

• **Case Study 1 - Designing Multimodal Rehabilitation Approach – Phase 2:**

For **Phase 2**, the design approach with Indian music was based on the outcome of **Phase 1**, the initial evaluation, objective of **Phase 2** and with all modalities mentions in the table above. Variations in rendition, music playing, employing visual cues and in story-telling were decided by the music therapist as appropriate.

• **Case Study 1 - Administration – Phase 2:**

○ **Methods**

- Receptive/ passive music intervention was administered along with some active intervention where she was helped to keep rhythm and clap with songs and rhythmic compositions
- Omkara chanting and other Mantras was played (by family members)

- Old family photos were shown to her by associating names to faces in order to help her recognize the people in the photos. These were used as visual stimuli primarily as memory boosting aid while the familiar music was played
- Stories were used as other modality. Stories of old events connected with the patient were narrated along with the associated visual tools/ cues

○ **Duration**

- Music intervention (vocal) was given 4 days a week, one session a day for at least 20 minutes per session
- Visual stimuli through old family photos and with name to face association was given at least 10 minutes per session, 4 days a week
- Stories were narrated at least in one session in 4 days with Raag based music at the background
- Omkara chanting and other Mantras were played alternatively at least 4 days a week for 15 minutes during morning and evening each (by family members)
- The multimodal rehabilitation process continued for 24 months (2 years) in **Phase 2**

• **Case Study 1 - Method of Assessment /Observation – Phase 2:**

Same as detailed under relevant heading for **Phase 1^P**

• **Case Study 1 - Outcome – Phase 2:**

The observation through session feedback, video recording and feedback from the family members were collated, compared and reviewed carefully every week to infer the following qualitative outcome:

○ **Changes Observed**

- Her restlessness was controlled immensely
- Her violent streaks too reduced considerably

As per **Phase 2** objectives, she

- Started recognizing a few family members
 - Was better in handling a few of her daily tasks including eating food and brushing hair
 - Her prescribed medication was reduced (by doctor)
 - Started greeting people with a smile when met; thus behavioral change was observed
- **Change Not Observed**
- She still struggled with memory (except recognizing a few family members)
 - Was not able to get better in registering the day to day events and thus needed help to guide her
 - She was not able to read the time of the day
 - her cognitive functions, thinking, spatial orientation, reasoning were not improved
 - Still needed assistance in many of her daily activities

Case Study 1 - Phase 3:

In **Phase 3** of the longitudinal study (continued for another 12 months), the rehabilitation approach used for **Phase 1 and Phase 2** were continued. As outcome, her nerve calming medication was completely stopped (by doctor) and she was very much composed. Rest of the parameters did not change from what was observed in **Phase 2**.

Overall, **Phase 1 (12 months)**, **Phase 2 (24 months)** and **Phase 3 (12 months)** of multimodal intervention with Indian music for the patient having Alzheimer's disease witnessed a number of improvements from psychological, behavioral, neurological, functional and social perspectives as per the objectives in different phases, while some symptoms could not be managed.

Case Study 1 - Conclusion:

Medically, neuroscience studies have found that musical memory is different from other memory structures. In patients with Alzheimer's disease, brain area holding long-term musical memory was found to lose fewer neurons than the rest of the brain and metabolism in those areas is also decayed less. Thus the musical

memory most of the times is not affected by this disease or least affected. And that was possibly why the patient would decrypt or recall her musical memory when the specific songs were played.

The concrete reasons for these types of responses are still under evaluation. Also, why she was keen on listening to only few songs is another question as she might have heard other songs as well before developing this condition. However with time, she started accepting other music too once the multimodal approach was administered on a regular basis and in systematic manner. Her acceptance of the rehabilitation procedure was evident from the overall positive changes observed in her over the course of the longitudinal study.

Thus, from the outcome it is deduced that the multiple modalities with Indian music and other structured therapeutic activities were well received by the elderly patient having Alzheimer's disease and may be employed for patients with similar symptoms.

CASE STUDY 2 - RHEUMATOID ARTHRITIS:

Case Study 2 - Initial evaluation:

Name: XYZ

Gender: Female

Age: 67

Disease/ Disorder/ Condition: Rheumatoid arthritis (established)

Medication: Doctor prescribed medicines when the multimodal rehabilitation with music intervention started

Other Therapies: Physiotherapy twice a month

Multimodal Intervention Start Date: September 2018

“Rheumatoid arthritis (RA) is an autoimmune disease in which the body's immune system – which normally protects its health by attacking foreign substances like bacteria and viruses – mistakenly attacks the joints. This creates inflammation that causes the tissue that lines the inside of joints (the synovium) to thicken, resulting in swelling and pain in and around the joints. The synovium makes a fluid that lubricates joints and helps them move smoothly. If inflammation goes unchecked, it can damage cartilage, the elastic tissue that covers the ends of bones in a joint, as well as the bones themselves. Over time, there is loss of cartilage,

and the joint spacing between bones can become smaller. Joints can become loose, unstable, painful and lose their mobility. Joint deformity also can occur.”¹⁰

Few pointers (only condition related) from initial evaluation:

- As detailed by the patient, XYZ started developing the condition when she was 40 years old
- The reason for her established rheumatic arthritis is that she never took care of her nor did she take care of the condition when diagnosed since she was busy with her business
- Her bones were damaged
- Bones were deformed, bent and weak
- She had joints inflammation/ swelling
- She had pain and stiffness (during morning and when not active)
- Progression of disease caused deformities in
 - wrists
 - knees
 - elbows
 - waist
 - feet
 - shoulder joints
- She was not able to stand straight without support
- She was not able to walk without a stick properly (coordination between two legs are hampered causing imbalance)
- She would get exhausted soon
- She had breathing issue
- She often felt chest congestion
- She had dryness in eyes
- She had developed various functional restrictions namely
 - decreased physiological flexibility
 - shrunk muscle strength due to muscle degeneration/ atrophy
 - reduced cardiovascular endurance

One important point to note was, unlike the research findings, she is very social even with many difficulties.

The figure below shows a few disease specific symptoms of the rheumatoid arthritis patient.



*Fig 2: Original pictures of the rheumatoid arthritis patient with few disease specific symptoms for whom multimodal rehabilitation approach was employed***

It was important to note before the onset of the rehabilitation procedure that many of the disease specific symptoms of established rheumatoid arthritis were not feasible to be reversed (as discussed with the family doctor of the patient). The multimodal approach could help in alleviating a few symptoms and in preventing deterioration of a few, such as helping in pain management & stress relief and aiding in enhanced functional skills to have a better psychosomatic balance. The client had one desired outcome in mind and that was she should be able to walk better with balance and co-ordination and without a stick. Now, to be able to reach that state, as per initial observations, she should first be able to stand straight or at least be balanced when she stands without a stick. Thus, the rehabilitation approach needed to be designed and administered in phases (as was done for **Case Study 1** above) because it would be feasible to work on her desired outcome only after handling a few initial symptoms (if feasible) on which the future outcome depends. Thus, primary symptoms were targeted in **Phase 1** of rehabilitation process for strengthening her functional, neurological and psychological wellbeing. In this paper, we will restrict the scope to only **Phase 1** and discuss the feasibility of **Phase 2** of the study with multimodal approach.

Case Study 2 - Phase 1:

- **Case Study 2 - Objective - Phase 1:**

Primary objective was to examine whether the multimodal approach with Indian music was efficacious in managing her breathing issue, pain, balance while standing without stick and her posture while standing. It was important to address these symptoms in order to proceed further.

- **Case Study 2 - Tools used in Multimodal Rehabilitation Approach with Indian Music – Phase 2:**

Pre-therapy assessment or initial evaluation (as discussed with the patient) revealed that she needed a few practices that could improve her breathing, physical & functional challenges. Basic Yogasana and breathing techniques as per Yoga teaching were employed along with Indian music and rhythm as rehabilitation modalities. She is very fond of Krishna Bhajans and melodious Hindi film songs. And that fondness worked as the first step towards her self-recuperation.

****Note: the basic Yogasana and other practices that required movement of her body parts were decided and designed as per the consent of the patient's doctor. This was a must before any rehabilitation technique was administered to the patient having established rheumatoid arthritis and aforementioned complications.**

Following musical elements/ tools/ modalities were used in the multimodal approach for her rehabilitation as per the study objective:

Music	Musical Elements/ Tools/ Modalities
Mantras	<ul style="list-style-type: none"> • Omkara • Other Mantras
Raag	<ul style="list-style-type: none"> • Behag • Tilak Kamod • Shankara • Kedar
Elements of Raag	<ul style="list-style-type: none"> • Alaap • Vistaar • Alankars • Taans

Music/ Songs	<ul style="list-style-type: none"> • Krishna bhajans • Raag based melodious Hindi film songs • Raag based soft instrumental music
Rhythm	<ul style="list-style-type: none"> • Diverse Taalas as demanded by music or independently • Clapping • Tapping different body parts from foot to upper body parts
Yogasana	Examples
Basic Yogasanas (that involved full body movements with Omkara chanting, Mantra or soft Raag based music at the background. Important to mention is, the expectation was her attempt to do the Yogasanas as much as she could considering her physical condition)	<ul style="list-style-type: none"> • Tadasana • Ardha-halasana • Virabhadrasana • Hastauttanasana • And more
Breathing	<ul style="list-style-type: none"> • Yogic breathing • Anulom, Bilom • Nadi sodhan
Other	<ul style="list-style-type: none"> • Yoga nidra
Others	Tools
Musical instruments to play	<ul style="list-style-type: none"> • Khartaal • Egg Maracas
Musical games	<ul style="list-style-type: none"> • Games with visual cues for better brain and memory exercises • Ball game for functional skill enhancement

Table 3: Elements/ tools/ modalities for Phase 1 of intervention for RA patient

- **Case Study 2 - Designing Multimodal Rehabilitation Approach – Phase 1:**

For the RA patient, the multimodal approach with Indian music was designed considering the initial evaluation, objective of the longitudinal case study and with all modalities mentions in the table above. Variations in rendition, music playing, Yogasana as well as in employing visual cues were decided by the music therapist as appropriate.

- **Case Study – 2 - Administration – Phase 1:**

- **Methods**

- Active rehabilitation techniques were predominantly used for XYZ, wherein
 - a. she would sing and recite Mantras with music therapist's instructions
 - b. do Yoga (Yogic breathing, Yogasana) as per instruction of Yoga instructor
 - c. hold and play musical instruments and tap different body parts with rhythmic music as per instructions from music therapist
 - d. play musical games as instructed by music therapist
- She was given receptive intervention such as Yoga nidra
- Omkara chanting and other Mantras were played during morning and evening by the patient (not during session)

- **Duration**

- Rehabilitation techniques administered one session a day, 4 days a week, one hour per day:
 - a. Any two active therapy/ rehabilitation modules (listed above, decided by music therapist) would be administered per session, 20 minutes each
 - b. 20 minutes of Yoga nidra would be administered in each session (receptive)
- Omkara and other Mantras were played at least 4 days a week for 15 minutes during morning and evening each by the patient (not during session)
- The rehabilitation process continued for 12 months

- **Case Study – 2 - Method of Assessment /Observation – Phase 1:**

In this longitudinal study, qualitative observations were recorded as follows:

- Session feedback in the form of notes for each sessions and for repeat administration of the rehabilitative measures were taken (by music therapist and Yoga instructor)
- Video recordings for sessions in regular intervals were taken
- Still pictures of the patient was taken as per the demand of the therapy

- Feedback from patient about her experience during the rehabilitation process was taken to cross-verify her feedback with those noted by the music therapist and Yoga instructor.

- **Case Study 2 - Outcome – Phase 1:**

The observation through session feedback, video recording, still pictures of the patient in sessions and patient's experience during the therapeutic/ rehabilitation process were collated, compared, reviewed and analyzed carefully every week to infer the following qualitative outcome:

- **Changes Observed**

- 4 months after continuing with the multiple modalities with Indian music and with her dedication to religiously follow the regime, the RA patient had better balance in standing [fig 3 below]
- she started walking without a stick in the room more confidently and faster than how she would do before the start of the modules 4 months ago; thus her gross motor skill improved



Fig 3: Original picture of rheumatoid arthritis patient's balanced and coordinated posture 4 months after using multimodal rehabilitation approach with Indian music

- Her physiological balance and coordination of different body parts was better, which was evident from her standing posture (marginal improvement) and walking

After 10 months

- She got some relief from joint pains (as per patient's experience)
 - Her breathing was better
 - Her finger movements improved hence the fine motor movements were better
 - Stiffness (knee, wrist) were relieved to some extent (as per the patient's experience)
 - Her walking improved
 - Her flexibility in the torso, shoulder and neck was better (as per the patient's experience)
 - She would get less exhausted than before; thus, her overall physical endurance improved
 - She was more relaxed (as recounted by the patient)
- **Changes Not Observed**
- Swelling existed in her
 - a. finger joints
 - b. knee joints
 - There were no change in her existing deformities in
 - a. wrists
 - b. knees
 - c. elbows
 - d. waist
 - e. feet
 - f. shoulder joints
 - She would still have some pains in joints occasionally
 - The occasional dryness in eye still exists
 - Muscle strength except for a few body parts was still weak
 - Standing posture improved marginally in spite of better standing balance
 - All her prescribed medicines continued

Case Study 2 - Conclusion:

The longitudinal qualitative study with rheumatoid arthritis patient has offered encouraging outcomes, which suggests the feasibility of using multimodal rehabilitation approach with Indian music for symptom management of rheumatoid arthritis patients.

With neuroscientific point of view, it can be mentioned that her accepting of the rehabilitation modalities with Indian music helped create new neural pathways and her repeated practice made sure that the whole body including muscle, cell etc., her mind and psyche all worked in synchronization for better entrainment and rehabilitation; and as a result the new neural pathways were being solidified.

The complete rehabilitative process involving music, rhythm, Yoga practices and more worked as multisensory (visual, auditory, kinesthetic, tactile and others) stimulus that was important for her overall recuperation. For example, to improve fine motor skills of fingers, multisensory stimulus was administered through musical instruments that were held by the patient with the palm and finger support, played those as well as tapped in different body parts, sang, as per instruction, kept rhythm and listened sound of music. Here the patient is listening to the music, focusing on the rhythm, tapping in body parts, experiencing the process visually and following instructions from the therapist. The whole coordinated process stimulated various senses, signaled the brain for strengthening the neural pathways so as to release appropriate neurochemicals as and when the actions are repeated and practiced. And yes, the approach for stimulating senses may vary for different disorders/ conditions.

Case Study 2 - Towards Quantitative Analysis (Evidence-Based Research)

Outcome from the **Phase 1** longitudinal study establishes the feasibility of a **Phase 2** of the study to examine the effect of multimodal approach with Indian music on gait quality of rheumatoid arthritis patient. This is deduced from the fact that the objective of **Phase 1** of the study (improved breathing, improved pain relief, better standing balance without stick, better flexibility in neck head and torso) for the RA patient were met to a good extent. Thus, a feasible quantitative study with evidence based measurable research, appropriate to gait quality analysis can be conducted using multiple modalities with Indian music as the base. Both qualitative as well as quantitative data can be captured as relevant for the study for further analysis and inference.

DISCUSSION:

Limitations of the Studies:

- The paper examines the effect of the multimodal approach with Indian music on the neuro-psycho-social rehabilitation of **only** two patients having diverse diseases/ disorders through longitudinal studies. Further intensive, repeated measure research is required to be conducted in order to assess the sustained effectiveness of the multimodal approach for these two conditions or for other conditions with reproducible results.
- Only **qualitative** observations are analyzed for two independent case studies without measurable parameters. No scaling or grading was done. Thus, quantitative study needs to be designed and executed in order to assess efficacy of the multimodal approach for measurable evidence based outcome.

Research Opportunities from the Case Studies:

- The overall outcome of these two longitudinal case studies offers opportunities to evaluate the effectiveness of the multimodal approach by
 - Conducting experiments (evidence based research) for conditions/ symptoms of elderly patients having Alzheimer's disease and rheumatoid arthritis as discussed in the paper
 - Conducting experiments (evidence based research) for elderly patients having other diseases/ disorders with similar conditions/ symptoms
 - Conducting experiments (evidence based research) for patients having other conditions

Concluding Notes:

Music intervention (melody and rhythm) is a scientifically proven measure to manage multiple disorders as it works on the whole brain. Other modalities along with music expedite the process of healing and recuperation from diverse conditions. The two cases discussed in the paper (one for an elderly patient having Alzheimer's disease and the other for an elderly patient having established rheumatoid arthritis) offers promising qualitative results wherein ancient Indian practices like Yoga, Mantra, Indian music, Taala and more were used as modalities for offering better neuro-psycho-social rehabilitation and superior quality of life to elderly patients. This was possible because the multiple modalities in the rehabilitation approach were accepted well by both the patients and their participation (active / receptive) improved every week. This indicates that they had opened up to the rehabilitation process, taken part in various activities and were motivated to be functionally active. That was indeed a sign of positive psychology, better social interaction,

improved neural entrainment and physical endurance. It is evident that the 3Ds [disorders, diseases and disabilities] of old age can be managed well to a great extent by regular practice of these techniques under guidance of qualified instructors. The elderly connect to music and rhythm instantly as any of us do since music and rhythm are the essential components of our inner being. Coupled with that, other practices and modalities are found to be considerably effective.

Appendix:

AD	Alzheimer's disease
AIDS	Acquired immunodeficiency syndrome
MCP	Metacarpophalangeal
MTP	Metatarsophalangeal
RA	Rheumatoid arthritis
WHO	World Health Organization

References:

1. http://mospi.nic.in/sites/default/files/publication_reports/ElderlyinIndia_2016.pdf
2. <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
3. <https://www.alz.org/in/dementia-alzheimers-en.asp>
4. <http://ardsi.org/downloads/ExecutiveSummary.pdf>
5. <http://www.arthritis-india.com/>
6. <https://pediatrics.medresearch.in/index.php/ijpr/article/view/366/730>
7. https://www.researchgate.net/publication/297633491_A_randomized_controlled_trial_of_two_simple_mind-body_programs_Kirtan_Kriya_meditation_and_music_listening_for_adults_with_subjective_cognitive_decline_Feasibility_and_acceptability
8. https://ard.bmj.com/content/74/Suppl_2/1304.4
9. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5385828/>
10. <https://www.arthritis.org/about-arthritis/types/rheumatoid-arthritis/what-is-rheumatoid-arthritis.php>
11. Music Therapy with Indian Music (Essentials & Sources) – Volume 1 by Ruma Chakravarty
12. Naradiya Siksa by Narada – Compiled by Bhattashobhakar and Published by Pitambarapith Sanskrit Parishad, Datiya

Acknowledgement:

1. We thank Srijan Foundation Trust for offering grant (in availing secretarial assistance, expert guidance, transportation etc.) while developing this research paper
2. We thank Factorize and SurManjari (Music Education and Music Therapy & Research Foundation of Factorize) for guiding us with their “Multimodal Rehabilitation Approach with Indian Music” for conducting the longitudinal feasibility studies

