



Raag Therapy as Complementary Intervention For Pediatric Neurodevelopmental and Behavioral Disorders

Author: Achint Kaur

August 30th, 2025

Raag Therapy as Complementary Intervention For Pediatric Neurodevelopmental and Behavioral Disorders

Achint Kaur

Abstract

Pediatric neurodevelopmental and behavioral disorders such as Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), Tourette's Syndrome, Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD) present with complex challenges involving social, emotional, and cognitive functioning. Conventional intervention approaches in the west, and worldwide as well often include behavioral therapies, educational interventions, and pharmacological treatment. However, alternative and less conventional interventions have been growing in medicine as well. A major technique that has been used in treatment recently has been music therapy. This analysis will be particularly looking at raag therapy and its potential benefits.

Keywords

Autism Spectrum Disorder, Raags, Raag Therapy, Pediatric Behavioral Disorders, Indian Classical Music

Introduction

Raags are frameworks used in Indian classical music that are carefully structured to evoke certain emotions, mental atmospheres, or moods. There are hundreds of raags, and each raag is characterized by a unique set of ascending and descending notes, also known as aroh and avroh ^[1]. Unlike western scales, raags are not just a group of pitches, rather are expressive structures that are associated with particular times of days, months, seasons, and emotions. In Indian classical music traditions, raags are the foundation of compositions, improvisations and performances. Raags can have an influence on many various aspects such as calming the mind, energizing the body, or evoking a wide range of emotions. This plethora of effects has led to increasing interest in the use of raags within

therapeutic settings, where specific raags can be employed intentionally to regulate components such as mood, attention, and emotional well-being.

Shudh, or natural, notes are generally understood to have a happy tone, while vakrit, or flat/sharp, notes can elicit deeper sadness or other emotions. Raags can be placed on scales to help understand what specific emotion they elicit. By judging the emotion/valence (positive or negative) and arousal (high or low), raags can be accurately identified to aid in behavioral therapies ^[11].

This paper explores the theoretical foundation of raag-based interventions in pediatric populations. It outlines the neuroanatomical and physiological changes associated with each disorder such as dopamine dysregulation, prefrontal cortex impairment, and altered serotonin pathways. This paper will analyze the known effects of musical stimulation on brain function. Specific raags, such as Raag Bhairavi, have been associated with reduced stress and improved emotional states, which may support attention and emotional regulation in individuals with neurodevelopmental conditions ^[2]. While direct evidence in behavioral regulation disorders is limited, structured music interventions have been associated with reduced stress and improved emotional regulation, suggesting potential benefits for children who exhibit impulsivity or defiance ^[10].

While most of the current evidence is largely correlational, raag therapy offers a culturally resonant, low-cost, and non-invasive complement to standard Western medicinal treatments. This paper aims to show possible gaps in treatment options and encourage further exploration into raag therapy as a complementary intervention.

Limitations

While this paper highlights the potential therapeutic benefits of raag-based interventions in therapeutic approaches while managing pediatric neurodevelopmental and behavioral disorders, it is important to acknowledge several limitations of this research. First, much of the current evidence supporting raag therapy is anecdotal or based on small-scale studies. These have limited sample sizes and short durations which can influence the power of the studies. There is a lack of randomized controlled trials that can establish causation, rather than correlation like this paper does. Cultural familiarity with Indian classical music may also influence its efficacy, limiting its applicability in non-South Asian populations. Additionally, standardized protocols for implementing raag therapy such as duration, frequency, and raag selection are not fully seen in these studies. These gaps show the need for more rigorous research to validate raag therapy as a clinically recognized complementary treatment.

Neurodevelopmental and Behavioral Disorders

Neurodevelopmental disorders

Neurodevelopmental disorders in pediatric populations, including Autism Spectrum Disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), and Tourette's Syndrome, are defined by early-onset impairments in cognition, communication, behavior, and motor coordination. These disorders require long-term, multifaceted intervention strategies and are categorized with atypical brain development.

Autism Spectrum Disorder (ASD) presents with deficits in social skills and communication, alongside repetitive patterns of behavior ^[4]. Neurobiologically, ASD is associated with underconnectivity between distant brain regions, altered serotonin signaling, reduced Purkinje cells in the cerebellum, and imbalances in GABA and glutamate neurotransmission ^[3]. According to the DSM-5, ASD symptoms must be present in early childhood and significantly impair daily functioning ^[4].

Attention-Deficit Hyperactivity Disorder (ADHD) is defined by a persistent pattern of inattention and hyperactivity-impulsivity that interferes with daily functioning or development. Neuroimaging has shown reduced dopamine neurotransmitter levels, hypoactivity in the frontal-striatal circuitry in the brain, and delayed cortical maturation in children with ADHD ^[5]. Treatment for ADHD generally includes medications such as methylphenidate in combination with behavioral therapy interventions.

Tourette's Syndrome is a tic disorder involving multiple motor and at least one vocal tic, persisting for over a year. It is linked to heightened dopamine activity and altered functioning in the basal ganglia and cortical-striatal-thalamic circuits ^[6]. The DSM-5 outlines criteria requiring onset before age 18, persistence of symptoms, and exclusion of other medical causes.

Management strategies for these conditions combine behavioral interventions, educational support, and in some cases, a pharmacotherapeutic approach. Early identification and intervention are key to improving developmental outcomes. Applied Behavior Analysis (ABA), speech therapy, and occupational therapy are widely used in ASD cases. Stimulant medications are common in ADHD. Lastly, Comprehensive Behavioral Intervention for Tics (CBIT) is used for Tourette's ^[6].

Recent rising interest in music therapy has opened the possibility in alleviating symptoms associated with neurodevelopmental disorders. Among various forms of music therapy,

Indian classical music has gained recognition for its ability to evoke targeted emotional and physiological responses. Raags are musical scales that have expressive structures designed to influence mental states or moods ^[11]. This emotional component makes them especially valuable in therapeutic settings that aim to regulate mood, attention, or sensory deficits in children.

Preliminary studies have highlighted the potential of certain raags to promote emotional balance and attentional control. For instance, Raag Yaman is often used to evoke tranquility and joy, and has been noted to reduce anxiety and foster calmness in children with Autism Spectrum Disorder ^[1]. A case study was conducted involving a 24-year-old female; Over 15 days of daily sitar listening sessions, it was observed that there was approximately a 40% reduction in depressive symptoms (Beck Depression Inventory) and a 35% decrease in anxiety (Hamilton Anxiety Rating Scale). This emphasizes the capacity of Raag Yaman to increase feelings of calmness and uplift mood. This raag is very close to, and often is almost synonymous to, the 29th shudh raag, Raag Kalyan. We can deduce that Kalyaan Raag would have a similar calming effect as well. Raag Bhairavi has been linked to improved focus and a reduction in irritability ^[2]. A pilot trial implementing virtual music therapy centered on Raag Bhairavi demonstrated significant reductions in stress, anxiety, and depression. After six days, participants showed significantly lower levels (measured by DASS-21), along with improved heart rate variability further proving the raags calming and attention-enhancing effects.

Although Raag Bhairavi is not included among the 31 prescribed raags in the Sri Guru Granth Sahib, Raags such as Asavari Sudhang emphasize structural components including surs used ^[13], elicit positive emotions such as happiness and hope ^[12]. Shabads written in Asavari Sudhang such as Hau Andhin Har Naam Keertan Karo have themes of constant devotion and teach that Sikhs can't live without Waheguru even for an instant ^[14]. Waheguru Himself guides us to the path of singing praises of His creation and staying content with what we are given in this life ^[14]. These concepts in Gurbani can support treatment for children with neurodevelopmental conditions by giving them strength and contentment to accept hukam. These findings suggest that therapeutic adaptations of Gurmat based raags could act as behavioral interventions for children with ASD, ADHD, or general emotional dysregulation. The combination of emotion in the raag and realizing the meaning of the bani has a large scope to be beneficial in an adjunctive treatment option. These correlations open new possibilities for integrating Gurmat Sangeet into therapeutic interventions, especially for pediatric populations.

While the evidence base remains limited, these findings indicate that incorporating raag-based music therapy into pediatric care could enhance conventional behavioral and

pharmacological interventions. Its cultural nature makes raag-based music therapy particularly suitable for children from Sikh and South Asian adolescents. Further clinical studies are needed to determine the strengths of the correlation between these variables to determine standardized protocols for therapeutic use.

Behavioral Disorders

Beyond neurodevelopmental disorders, children may also experience behavioral regulation disorders, including Oppositional Defiant Disorder (ODD) and Conduct Disorder (CD). Both of these disorders have persistent patterns of disruptive, defiant, or aggressive behavior ^[4]. They also are often associated with emotional dysregulation, social difficulties, and academic challenges, similar to neurodevelopmental disorders discussed above. A major difference, however, is that behavioral regulation disorders typically emphasize externalizing behaviors and are linked to dysfunction in brain regions governing impulse control and emotional processing ^[9].

Oppositional Defiant Disorder (ODD) is characterized by a consistent pattern of angry or irritable mood, and argumentative or defiant behavior lasting at least six months ^[4]. Neurobiologically, children with ODD show reduced activity in the prefrontal cortex (PFC). Kids also present with abnormal activation in the amygdala which is the brain's emotional center ^[10]. Dysregulation in both dopamine and serotonin pathways has also been observed, contributing to impulsivity and emotional reactivity ^[10].

Conduct Disorder (CD) is a more severe behavioral condition that involves repetitive violations of societal norms and shows symptoms such as aggression, violence, and/or destruction of property. CD has been associated with lower baseline cortisol levels, smaller amygdala brain region and PFC volume, and impaired responses to punishment and empathy-related cues ^[5].

Management strategies for ODD and CD often involve multiple approaches, including behavioral therapy, family interventions, school intervention, and in some cases, medication for mood stabilization. Early diagnosis and psychosocial interventions like Cognitive Behavioral Therapy (CBT) have shown efficacy in reducing disruptive symptoms ^[10].

Music-based interventions are promising complementary therapies in this category as well. A study by Vempati & Telles showed that a combined music and yoga program significantly reduced symptoms of inattention, hyperactivity, impulsivity, and oppositional behavior in children with behavioral disorders ^[8]. Music therapy may help regulate arousal levels, enhance focus and stability, and improve emotional control. Though most

studies use Western music or general instrumental sessions, the structure of Indian raags known for grounding effects can have a similar impact.

For example, Raag Bilaval, found in Sri Guru Granth Sahib Ji, is known for its capacity to provoke an uplifting and positive mood and could be used for children experiencing emotional outbursts or irritability. Its association with positive emotion such as happiness and joy ^[12] can aid with the needs of children with ODD or CD who struggle with defiance. Using Gurmat Sangeet as a therapeutic intervention not only honors the background of Sikh children but also can be a new way to involve a holistic therapeutic intervention in the daily life for clinicians and patients.

Conclusion

The integration of raag therapy into pediatric behavioral and neurodevelopmental disorder management can be an impactful approach to helping with emotional and cognitive regulation. While conventional treatments remain essential, incorporating raags that we see in Gurmat Sangeet may offer unique methods for improving attention, reducing anxiety, and promoting emotional balance especially for patients with a Sikh background. This new intersection between music, neuroscience, and culture should encourage us to look deeper into its full therapeutic potential.

References

1. Aparna K, Lal K. Effect of listening to Raag Yaman on psychological well-being during the COVID-19 pandemic: A case study. *International Journal of Research Publication and Reviews*. 2023; 6(6): 2914–2919.
2. Jain M, Kumari R, Das A. Therapeutic impact of Raag Bhairavi using virtual reality music therapy: A pilot intervention. *Indian Journal of Psychiatry*. 2024; 66(Suppl 1): S89–S95.
3. Geschwind DH, Levitt P. Autism spectrum disorders: developmental disconnection syndromes. *Current Opinion in Neurobiology*. 2007; 17(1): 103–111.
4. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. Arlington, VA: American Psychiatric Publishing; 2013.
5. Hyde LW, Shaw DS, Hariri AR. Fear conditioning, persistence of disruptive behavior, and psychopathic traits: an fMRI study. *Translational Psychiatry*. 2013; 3: e319.
6. Singer HS. Tourette syndrome and other tic disorders. In: Boller F, Johnson KL, editors. *Handbook of Clinical Neurology*. Vol. 100. Elsevier; 2011. p. 641–657.
7. Volkow ND, Wang GJ, Kollins SH, Wigal TL, Newcorn JH, Telang F, Fowler JS, Zhu W, Logan J, Ma YM, Pradhan K, Wong C, Swanson JM. Evaluating dopamine reward pathway in attention-deficit/hyperactivity disorder: Clinical implications. *JAMA*. 2009; 302(10): 1084–1091.
8. Vempati RP, Telles S. Yoga-based guided relaxation reduces sympathetic activity judged from baseline levels. *Psychological Reports*. 2002; 90(2): 487–494.
9. Blair RJR. Neurobiological basis of aggression and disruptive behavior disorders. *Current Opinion in Psychology*. 2016; 3: 56–62.
10. Matthys W, Vanderschuren LJMJ, Schutter DJLG. The neurobiology of oppositional defiant disorder and conduct disorder: Altered functioning in three mental domains. *Development and Psychopathology*. 2012; 24(1): 337–353.
11. Valla JM, Alappatt JA, Mathur A, Singh NC. Music and emotion—a case for North Indian Classical Music. *Frontiers in Psychology*. 2017; 8: 2115.
12. Singh H. Emotional Aspects of Shudh Raags. [Lecture Week 7] Gurmat Sangeet Research Internship; 2025.
13. Singh S. *Sri Guru Granth Sahib Darpan: Pothhi 3*. Hoshiarpur, Jalandhar: Raaj Publisher; 1962. Pg 159.
14. Gurmat Gian Group. Raag Asavari Sudhang. 2023. Available from: <https://gurmatgiangroup.com/raag-asawari-sudhang/>