



REVIEW

Neurodiversity and Inclusive Education: A Therapeutic and Pedagogical Approach from Music Therapy in Early Childhood Education from a Systematic Review

Neurodiversidad y educación inclusiva: Un enfoque Terapéutico y Pedagógico desde la Musicoterapia en la Educación Inicial desde la revisión sistemática

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ABSTRACT

Neurodiversity from the perspective of inclusive education has generated intervention processes that have been addressed from music therapy in the expression of human diversity in this research addresses the therapeutic approach of intervention from music in the comprehensive care of neurodivergent students. The objective was focused on analyzing the designs and implementations of the effectiveness of music therapy programs in students who present neurodiversity situations through the therapeutic and pedagogical strategies reported from scientific evidence. The method used refers to the systematic review from the PRISMA statement through the analysis of three categories of variables. The discussion focused on the reports and evidence generated from the interventions with music at the level of increasing cognitive, emotional, social and relational development in early childhood education students. In conclusion, it was identified that the promotion of emotional regulation skills, communication dynamics and social integration lead to increased levels of adaptation and inclusion that lead to improved academic success and inclusion in neurodivergent students.

Keywords: Neurodiversity; Music Therapy; Inclusive Education; Intervention; Emotional Regulation; Social Skills.

RESUMEN

La neurodiversidad desde la perspectiva de la educación inclusiva ha generado procesos de intervención que han sido abordados desde la musicoterapia en la expresión de la diversidad humana en esta investigación se aborda el enfoque terapéutico de intervención desde la música en la atención integral de los estudiantes neurodivergentes. El objetivo se centró en analizar los diseños e implementaciones de la efectividad de los programas de musicoterapia en estudiantes que presentan situaciones de neurodiversidad a través de las estrategias terapéuticas y pedagógicas que se reportan desde la evidencia científica. El método empleado hace referencia a la revisión sistemática desde la declaración de PRISMA mediante el análisis de tres categorías de variables. La discusión se centró en los reportes y evidencias que se generan desde las intervenciones con música a nivel del aumento del desarrollo cognitivo, emocional, social y relacional en estudiantes en educación inicial. A nivel de conclusión se identificó que el fomento de las habilidades de regulación emocional, las dinámicas de comunicación y la integración social conllevan a que aumenten los niveles de adaptación e inclusión que conllevan a mejorar el éxito académico y la inclusión en estudiantes neurodivergentes.

Palabras claves: Neurodiversidad; Musicoterapia; Educación Inclusiva; Intervención; Regulación Emocional; Habilidades Sociales.

INTRODUCTION

Music therapy focused on neurodiversity and inclusion is a tool that has proven effective in intervention processes for students with special educational needs. The active participation of students in the learning process fosters the development of communication skills and improves social and interpersonal relationships.⁽¹⁾ The increase and significant improvement in expression, interaction, and connection with the peer group favors social integration and increases positive bonds both inside and outside the classroom.⁽²⁾

The proven effectiveness of music therapy additionally helps students with different educational needs from the postulates of neurodiversity to promote self-regulation processes and improve attention and following instructions, which is key in cognitive rehabilitation processes.⁽³⁾ Likewise, evidence indicates that emotional regulation processes are developed that focus on intrapersonal adequacy and increase the chances of academic success.⁽⁴⁾ The motivational nature of music generates in individuals a greater interest and motivation that contributes to generating more pleasant and meaningful learning experiences.⁽⁵⁾

Neurosciences through brain plasticity have shown that the relationship with music therapy in cases of intervention directed from educational inclusion increases executive, sensory, and motor functions.⁽⁶⁾ This means that brain stimulation integrates the development of fundamental skills in which the processes of sensory perception, reasoning, and memory are increased.⁽⁷⁾ The increase of self-esteem and self-recognition processes in students with educational needs increases when guided interventions are carried out that allow them to address educational challenges and the increase of soft skills that lead to improved academic success and self-recognition in the different areas of performance favoring participation and integration within school contexts.⁽⁸⁾

The cognitive aspects that are strengthened through intervention from music therapy, neurosciences, education, psychology, and pedagogy require a multidisciplinary approach to promote significant improvement in learning processes.⁽⁹⁾ In the context of neurodiversity and inclusive education, the contributions that arise to address educational needs focused on the therapeutic objectives through sounds, rhythms, harmonies, and melodies denote that learning difficulties, behavioral problems, communication difficulties, and attention to the needs of children and adolescents, as well as the need to improve the learning process, are the most important issues that need to be addressed.⁽¹⁰⁾

The promotion of motivation and participation in learning processes,⁽¹¹⁾ are focused on the sensory and cognitive stimulation that occurs through music therapy, which generates motor development and coordination in which the promotion from the promotion of creative capacity and the development of social skills create learning experiences that are adapted to the individual needs of students.⁽¹²⁾ The neuroeducation approach is linked to the relationship between music and cognitive functions in which the adaptation and intervention of individual needs favor the development and learning of students with special educational needs.⁽¹³⁾

METHOD

The technique used is quantitative and is based on systematic literature reviews using extraction based on Boolean equations. Systematic study mapping was used to create a review that takes into account advances in the field of study. The search is based on the research question, the scope of the study, and the main papers that were identified, evaluated, and synthesized using scientific evidence using the PRISMA approach.⁽¹⁴⁾

Protocol procedure

The research question guiding this research is How can the implementation of Music Therapy in Early Education settings contribute to the development of inclusive educational practices and the therapeutic approach to the needs of the neurodiverse population? From the bibliographic search, using the databases, Wos Clarivate, EBSCOhost, and Pubmed, carrying out the search using Boolean equations including them the inclusion and exclusion criteria.

Subsequently, the selection of the studies identified in the research reports was carried out taking into account the review carried out by the researchers. Filtering of the data using quality assessment that determines the reliability and validity of the data, using GRADE (Grading of Recommendations Assessment, Development, and Evaluation).⁽¹⁵⁾ The extraction and subsequent analysis are carried out using a systematic approach based on the contributions of the research results related to the findings to establish the quantitative estimate of the intervention processes.

Finally, a presentation of the results is made, following the protocol of the PRISMA guide,⁽¹⁶⁾ which provides detailed information on the included studies, generating an assessment of the overall quality reported in the scientific evidence that allowed the identification of the selected studies to be established in a clear and structured manner, ensuring the rigorous quality of the evidence-based review.⁽¹⁷⁾

Search strategy

The search was conducted in three databases Wos Clarivate, Ebscohost, and Pubmed. The searches were

conducted in the period between 2020 and 2024, taking into account that the search was restricted to the inclusion students with neurodiversity in early education; using the following equations: Neurodiversity AND Inclusive Education OR Therapeutic AND Pedagogical AND Music Therapy AND Early Education Music Therapy Strategies OR Inclusive Educational Practices Therapeutic benefits AND Pedagogical benefits AND Intervention challenges OR Implementation opportunities AND Implementation opportunities OR Teacher perceptions AND Family perceptions AND Family perceptions OR Social skills development AND Communication skills development Guidelines for inclusion AND Recommendations for inclusion.

Inclusion Criteria

Research on early childhood education students and neurodivergent students who have received music therapy interventions was included. Studies on music therapy interventions that considered teaching and learning processes were included. The type of intervention and control the students received were considered.

Exclusion criteria

Studies that included high school and college students in general, as well as those reporting clinical restrictions, were excluded. Also, along with gray literature, case reports, reviews, and data from books or reflections of letter editors were not considered. Randomized trials and observational studies were not used in this study, as pooled studies or studies with interventions were discarded.

Selection of studies

Through the PRISMA guideline criteria, articles were thoroughly examined during the selection and information extraction process, considering reports from the Wos Clarivate, EBSCOhost, and Pubmed databases. By examining the reports and titles along with the results and conclusions, compliance with the inclusion and exclusion criteria was assessed and duplicate articles were eliminated.⁽¹⁸⁾ Similarly, two investigators worked independently to cross-check the information and calculate concordance and discordance between reviewers to validate the information. Finally, the studies were included, as shown in the flow diagram (Fig. 1).

An Excel matrix was created with the data from the included research that included the intervention, number of participants, type of music used, methodology, results, and contributions. Health indicators related to communication skills, coping strategies, educational inclusion, and neurodivergence were also taken into account.⁽¹⁹⁾ The compare and contrast discussion was used to resolve data collection, agreements, and disagreements.

Quality of information

The “Primary Research Assessment Standard” was used to assess the quality of the research taking into account the fields. Studies were found to have a Cronbach’s reliability cut-off point of 0,81, which allowed deciding which articles to include and exclude. In addition, the information was selected taking into account detection, attrition, and reporting biases, and the information was contrasted by two reviewers.

RESULTS

The process of selection and elimination of the reported research is shown in the flow chart (figure 1). From the Wos Clarivate, Ebscohost, and Pubmed databases, 234 studies were eliminated. Twenty-four articles were analyzed by examining their titles, thematic relevance, intervention procedure, and contributions.

Categories of analysis

Neurodiversity and inclusion

Neurodiversity generates a recognition of differences in neurological processing from different approaches to human expression.⁽²¹⁾ The skills and the approach to perspectives in inclusive education lead to the participation of all students being fostered toward the development of equitable, egalitarian, diverse, and inclusive learning environments.⁽²²⁾ Music therapy facilitates the intervention from the integrative development in neurodiverse students because cognitive functions are promoted through musical stimulation, and there is a better focus on concentration and an adequate expression of emotions in which educational inclusion is developed in a more adaptive way.⁽²³⁾

Innovation strategies from music therapy, education, and pedagogy intervene in educational needs by promoting strengths and skills in neurodivergent students.⁽²⁴⁾ These strategies are based on the use of musical instruments that are adapted to generate new experiences at a multisensory level, through musical aspects that promote behavioral and emotional regulation, thus integrating into curricular designs that contribute to comprehensive training by promoting learning environments that focus on the potentiation of the strengths and abilities of individuals.⁽²⁵⁾

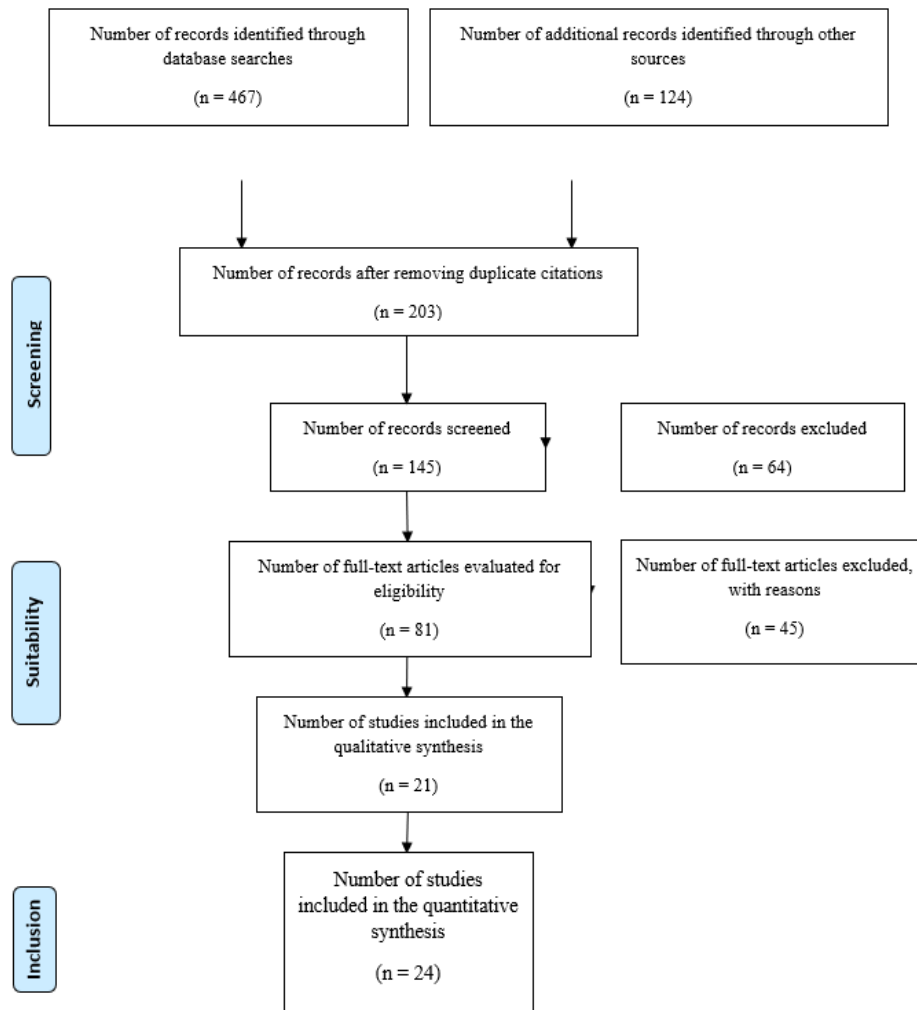


Figure 1. Prism flowchart

Therapeutic strategies from music therapy

One of the strategies most used by music therapists is guided improvisation, where therapists focus their intervention on the expression of emotions and feelings through the exploration of communication skills in which self-regulation is involved from a creative perspective that leads to increased confidence, the promotion of social interaction and autonomic development of the participants.⁽²⁶⁾ In addition to the techniques of musical receptivity where students select and expose different musical compositions in which they manifest to feel greater states of relaxation, concentration, and emotional regulation.⁽²⁷⁾ This combination of strategies turns out to be highly effective in processing the difficulties reported in which students are provided with tools to be used both in the classroom and in family dynamics that tend to stabilize moods and maintain calm and concentration in neurodiverse students.⁽²⁸⁾

Likewise, another technique that proves to be effective is the integration of activities from musical composition in which neurodivergent students encourage the development of creative solutions, and decision-making and improve self-esteem.⁽²⁹⁾ In this way, the processes of facilitation and social interaction are strengthened in that they work individually and cooperatively according to specific needs.⁽³⁰⁾ Instrumental learning strategies are also included, which include learning to play some instruments adapted to the needs on which the interventive work towards achievement and social integration is based, where students learn to listen, express, and value differences in a process of acceptance from the perspective of diversity.⁽²⁷⁾

Brain plasticity and music therapy

Brain plasticity allows individuals to carry out a reorganization and adaptation from the processes in which a deficit neuronal compromise is directly presented, which is linked in this case to neurodivergent students.⁽³¹⁾ It has been demonstrated that music therapy through exposure and participation induces positive and significant changes in which brain functions facilitate the development of cognitive and socioemotional skills.

⁽³²⁾ The neurobiological mechanisms support brain activation in a multimodal way when intervention processes are carried out through music because new synaptic connections are developed through auditory, sensory, and visual-motor stimulation, which favors compensatory skills that focus on adaptation and attention to the needs of students.⁽³³⁾

Music has characteristics that are linked to the capacity to induce emotional and psychophysiological states. These lead to facilitate learning processes and increase the levels of emotional regulation in neurodivergent individuals.⁽³⁴⁾ Activities that include a release of neurotransmitters such as dopamine, oxytocin, and endorphins have been shown to improve attention and concentration and decrease stressors and anxiety levels that are key in promoting well-being and psychic functioning. Generating development opportunities from social cognition, empathy, and socialization processes that help to improve students' abilities.⁽³⁵⁾

The matrix that condenses the analysis of the reported scientific evidence is presented below:

Table 1. Analysis matrix

N.	Author (year)	Methodology	Intervention	Contributions	City/country
1	Del Barrio, et al (2019)	Qualitative action research participation in music therapy sessions	through 32 estudiantes de musicoterapia de 40 minutos semanales en alumnos con necesidades educativas especiales.	Sesiones de 40 minutos semanales en alumnos con necesidades educativas especiales. Students who have special educational needs after music therapy interventions improved their body image, cognitive, communicative and social aspects.	Zaragoza Spain
2	González, et al (2021)	Qualitative, non-experimental, transectional-descriptive type	30 analysis of emotional neuroeducation and intellectual disability	Music therapy and neuroeducation promote the development of students who have neurodivergent conditions.	Bogotá Colombia
3	Kahveci, et al (2024)	Non-probabilistic mixed through interviews and analysis of perceptions with the MAXQDA program	42 participants intervention using rhythmic instruments.	Music, drama and body percussion activities increase participants' confidence and improve creativity rates for students with special needs	Northern Cyprus. Türkiye.
4	Pickard, et al (2020)	Qualitative case analysis	An analysis of five cases of music therapists was carried out from the social model of disability.	Music therapy and social models of intervention for patients with disabilities denote positive effects and reject their medicalization.	Welsh England
5	Broder-Fingert, et al (2023)	Qualitative reflective and interpretive type	Physical activities with students and integration processes with classmates	Music therapy has functions of development, rehabilitation, medical and educational applications and can be used for Improve Life Quality	Honolulu, United States
6	Hutson, et al (2022)	Qualitative phenomenological interpretation	with Positive understanding experiences among the community through forums and communications	The talents and expressive capacities of neurodivergent people, through support, understanding and acceptance, improve integration into learning communities.	Misuri. United States
7	Ryszarda, et al (2021)	Qualitative descriptive and interpretive analysis	Increased self-awareness in people with neurodiversity, through coping with stress and anxiety.	It is necessary to identify the needs and opportunities of students with neurodiversity, promoting inclusive and high-quality education.	Krakov, Poland
8	Gross, et al (2022)	Qualitative analysis	reflective Guided interventions from music therapy with neurodiverse students showing effectiveness.	Se rechaza el modelo médico de farmacoterapia y se apuesta por una intervención desde la música centrada en las necesidades de los pacientes.	Indiana United States
9	Dallman, et al (2022)	Qualitative interpretation	analytical Support to patients through emotional regulation processes and containment of triggering factors	Understanding the experiences of neurodivergent people favors occupational performance and promotes quality of life through acceptance and support, promoting change.	Towson United States
10	Pickard, et al (2022)	Qualitative analysis	critical Training in music therapy through socially just and anti-oppressive pedagogical dimensions.	Increase commitment to inclusion through empowerment to mitigate the marginalization of people with disabilities.	Wales, United Kingdom

11	Tang, et al (2024)	Cualitativo mediante análisis reflexivo teórico	Intervenciones sociales basadas en el respeto y la diversidad mediante concientización de realidades	Improve inclusion processes by promoting equality through an integrative vision that encourages changes in traditional paradigms.	London United Kingdom
12	Shaw, et al (2022)	Qualitative through phenomenological interpretation	Analysis of practical experiences through music therapy and the development of creativity.	Music therapy with elements of posthumanism present alternatives towards a practice of empowerment, enhancing the value of intervention in aspects of dependency.	New Zealand
13	Hogle, et al (2021)	Qualitative through case study	Inclusion processes mediated by music therapy develop shared participatory experiences.	Greater empathy is generated through interaction, didactics and the experience of inclusive musical education, increasing the learning processes	Oakland , USA
14	Lindetorp, et al (2021)	Mixed system in a workshop using quantitative and qualitative methods	The sounds of the ADMIs generated greater aspects of participation and inclusion in the participants.	Promote diversity and inclusion through musical activities, generating intervention processes in the learning processes of the participants.	Salamanca, Spain
15	Friedman, et al (2023)	Quantitative through systematic search	The intervention from occupational therapy in neurodiversity generated improvements in mental health.	Mental health processes through music therapy interventions determined the improvement in key aspects of therapeutic care	New Jersey USA
16	Peñalba, et al (2021)	Qualitative through participation research	Intervention with neurodiverse people, through the metabody program on musical devices.	Musical devices encourage gestural articulation and sounds in the participants' intervention, stimulating cognitive, physical and sensory aspects.	Barcelona Spain
17	Rabal-Millán, et al (2023)	Qualitative through participation and action	Intervention through the Nordoff Robbins Model or Creative Music Therapy and Improvisation	The intervention with people with nee has made the processes carried out through music therapy highly effective	Salamnca Spain
18	Ángeles, N. (2023)	Qualitative through field work	Intervention through music therapy sessions and melodic and rhythmic activities to promote language	Music therapy provided a greater increase in the stimulation of linguistic and social skills in the child and adolescent population that has been diagnosed with ASD, which increased the verbal and non-verbal abilities of the students.	República dominicana
19	Gioia, et al (2024)	Qualitative through group techniques	Music therapy interventions by stimulating the abilities of children with ASD	Music therapy improves aspects related to autism and strengthens the elements of social inclusion by promoting creativity and social interactions.	Goiás, Brasil
20	Castro, et al (2023)	Qualitative through hermeneutic method	Guided invention in the educational field to reduce stress and physical and cognitive rehabilitation	Learning aspects increased significantly due to the expression of emotions and empathy, improving satisfaction levels and increasing motivation and gratification	Lima, Perú
21	A v i l é s - Estrada, et al (2023)	Qualitative, through control group and participatory action (IAP)	Guided intervention through socialization and opening of emotions to reduce stress levels	Music Therapy produced a reduction in stress levels and contributed to a significant improvement in physical and psychological health through the stimulation of neurotransmitters.	Cochabamba - Bolivia
22	Cevallos, et al (2022)	Qualitative through surveys and interviews	Intervention indicated children with special educational needs, improved listening and interaction	The contributions indicate that motivation, attention, and learning were improved. Which benefits the executive functioning of students, increasing therapeutic and educational results.	Manabi Ecuador

23	Panchi, et al (2021)	Quantitative quasi-experimental with descriptive-correlational scope	Intervention of cognitive and metacognitive processes to improve pedagogical aspects in children to improve memory.	Significant changes were identified through melodic intervention and musical expression, generating an increase in memory processes through intervention with music in teaching processes.	Quito Ecuador
24	O r t e g a - Renteria, et al 82023)	Qualitative through hermeneutic techniques	Intervention in communication and social interaction difficulties, developing greater effectiveness in teaching-learning processes.	Educational processes that carry out music therapy interventions demonstrated high effectiveness in neurodivergent students and especially with those who have autism. Improving resources to strengthen reduced social interaction.	Quito Ecuador

DISCUSSION

Neurodiversity and inclusive education from the interventional processes of music therapy have generated a recognition and significant improvement in the brain and cognitive processing of people who require adaptation and promotion from educational approaches for neurodiverse students.⁽⁴⁰⁾ Music has widely demonstrated that the positive effects exerted in educational contexts lead to the facilitation of learning and increased participation in individuals and their families in which a relational bond is generated focused on gradually improving the integration and effectiveness of both personal and educational improvements that are presented.⁽⁴¹⁾

Musical listening and practice generate activation in different brain areas, which leads to greater benefits at a behavioral, emotional, cognitive, and relational level for neurodivergent students.⁽⁴⁴⁾ Continued participation in the development of musical activities leads to an improvement in communication skills in which social interaction and communication are integrated, which are key in the intervention for students with special educational needs, especially for those who have a diagnosis. Of autism spectrum disorders, dyslexia, attention deficit, and hyperactivity among other neurodivergent conditions that occur.⁽³⁸⁾

Emotional regulation and the reduction of stressors and anxiety symptoms in neurodivergent students strengthen the educational processes in which learning environments are created that lead to cooperative teachers, academic actors, students, and families helping to foster effective intervention in which emotional self-regulation and self-control strategies are prioritized, which lead to the nuance of emotions through music, improving the personal and educational aspects in which they are developed.⁽⁵⁹⁾ The promotion of inclusive environments promotes integration and diversity in school contexts, strengthening respect and a more empathetic and equitable culture of inclusion.

Scientific advances have made it possible to identify that music therapy and the activities that are carried out in groups of students strengthen social integration, develop socio-emotional skills, and develop better adaptive processes in which the cognitive benefits of neurodivergent students increase development and comprehensive training.⁽⁵⁸⁾ Music therapy and the musical elements used in the intervention favor addressing the physical and emotional needs that seek to promote comprehensive well-being and personal development along with the quality of life of the students. Promoting the expression and channeling of emotions through emotional regulation and self-awareness.⁽⁶⁰⁾

The therapeutic impact reflects greater emotional well-being and improves the self-esteem of neurodivergent students because the processes intervened through musical techniques allow the evocation of resources, emotions, and experiences that have been rewarding and that generate psychophysiological activations. Linked to the establishment of positive relationships.⁽⁶¹⁾ These strategies improve personal and educational experiences in a symbolic and recreational way that strengthens bonds and promotes emotional expressions, favoring affective regulation, increasing the level of satisfaction in interpersonal relationships, improving communication skills, and stimulating the cognitive development of children. Students.⁽³⁵⁾

The main advantages that are linked to therapeutic strategies are based on the promotion of emotional expression in addressing the different conditions that are linked to situations or conditions of both motor and cognitive disabilities and from which the interventional work is based. Links with creative strengthening.⁽³⁴⁾ Personal growth, the facilitation of adaptive processes in school environments, and the significant improvement in the quality of life leads to an integration of the cognitive, emotional, and behavioral processes that integrate the comprehensive well-being of individuals and from which music therapy generates multiple benefits on health and well-being.⁽¹⁰⁾

CONCLUSIONS

It is concluded that the interventional processes from music therapy in neurodiversity and inclusive education carried out in the initial education stage promote greater emotional expression articulated with

musical strategies such as musical composition, instrumental learning, and guided improvisation. In this sense, the connection and expression of emotions generate a processing that helps the release of neurotransmitters that promote significant well-being and the regulation of mood states that lead to the reduction of symptoms associated with anxiety, depression, and stabilization of the nervous system.

The therapeutic benefits of music in neurodivergent students have shown a reduction in biological markers associated with physiological responses that help patients show greater relaxation, concentration, and focus towards achieving personal and academic goals. Participation in music therapy interventions develops cognitive and emotional processes focused on increasing empathy and the assertive expression of emotions, generating greater social integration and emotional balance.

Finally, it is indicated that music therapy as an intervention support strategy for diverse educational needs is more effective in learning difficulties, autism, dyslexia, and other neurodevelopmental problems. Generating a positive and significant impact on the quality of life of the students analyzed from the systematic review in which it is indicated that inclusive learning experiences generate a holistic approach in which the cognitive, social, emotional, communicative, and psychomotor areas are improved, strengthening the well-being and progress of neurodivergent students.

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