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THERAPEUTICS BENEFICTS OF MUSIC

Imagen creada con Leonardo.ai por D. Gamella - Promt "Creatividad musical"

In music therapy, we need two shoes to walk in.
With one, we take therapeutic steps, improvise musically, and accompany the progress of our clients.
With the other, we analyze and observe, measure and calibrate the scope of each expression.
As part of the MiSOSTENiDO team, we continue to design evidence-based footwear lines to keep our feet firmly planted in research.

Imagen creada con Leonardo.ai por D. Gamella - Promt "Instrumento musical creativo"

EDITORIAL TEAM

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> Going a little deeper, questions arise, such as: How many would know how to explain the epistemology of the music therapy model they employ? How many would understand the theoretical foundations of their work? How many would know how to justify the ontological principles of music in music therapy?

THE LEGS OF THEORY AND RESEARCH

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The path of research continues in the journal Misostenido. We have no other destiny than to continue accumulating evidence to guide clinical decisions. Our stride is not very long, but it is firm and steady enough to take on future challenges and propose a path to professional consolidation in music therapy.

In the Spanish-speaking context, as an emerging discipline aspiring to recognition, music therapy must primarily address two fronts once the quality and consistency of initial university training has been ensured. The first is the development of evidence-based intervention methodologies. The second is the implementation of a research culture among its members. Both aspects must be interconnected and equally addressed.

Let us think about bodily movements in the act of walking. Walking involves the coordination of various systems. Understanding motor capabilities and sensory information, executive functions, and volitional acts allows us to adjust the strength, balance, and tension of the muscles to organize movement in a coherent and controlled manner. This logic of progress is easily transferable to the development and consolidation of music therapy based on the two aforementioned fronts.

Our professional advancement also requires the joint participation of the body (the theoretical corpus) and evidence-based practical methodology. The conjunction of both parts, as organs of a single system, supports music therapy as an academic and clinical field and enables movement.

Considering the laterality of the first limb, I wonder about the importance we really give to theoretical foundations. Due to a lack of our principles, we have been building the edifice of music therapy with contributions from other fields such as psychology, neuroscience, and medicine. Their constructs are secure, but we have had to adapt them to our conceptual framework. As translations, they are not fully understood as solid pillars upon which our discipline must be built. This inconsistency makes it easy to confuse them or even ignore them, leading to the use of peremptory supports that are not always solid and consistent.

In this sense, there is a tendency among music therapy students to focus heavily on procedures. They want to know how to make music that moves patients or how to use singing and musical improvisation to manage emotions. They do this without much consideration of why we proceed as we do or where we do it. The focus seems to be more on how to achieve the result than on its origin.

Without an integrated sense of theory, the impact of evaluation and critical analysis diminishes. Without them, supervision is distorted, the rigour of data collection is blurred, and we are distanced from results based on empirical data. Returning to the case, it is as if we have become comfortable walking on one leg, even though we have two.

Let's change sides now. A solid theoretical foundation is not enough if it is not complemented by rigorous practice. Evidence-based practice is the other necessary limb for progress. The incorporation of research protocols into clinical practice represents a step beyond the mere act of making music, for which we inevitably need to coordinate specialized motor skills finely. Strengthening these competencies is

essential to ensure correct movement. At Misostenido, we insist that their development is the core and unequivocal part of professional practice. Without an understanding of our actions, there is no possible explanation, no orientation in time, or criteria for change. Given the type of publication proposals we are forced to reject, several questions arise in this regard:

How many music therapists design their sessions based on validated scales? How many work with control groups? How many validate the items in their questionnaires? How many correlate variables, propose hypotheses, and systematize measurement tools? How many use t-tests, ANOVAs, Pearson classification, or linear regressions to analyze data sets and variables in quantitative models? How many of them perform open, axial, or selective coding and thematic analysis to ensure rigour through triangulation and verification of their qualitative frameworks?

Going a little deeper, questions arise, such as: How many would know how to explain the epistemology of the music therapy model they employ? How many would understand the theoretical foundations of their work? How many would know how to justify the ontological principles of music in music therapy? As can be seen, these questions leave gaps that cannot be filled.

The principle of movement begins with the balance between the parts, with the holistic dialogue of the body preparing to move forward. It is our responsibility to decide whether we opt for a harmonious and articulated movement or whether we choose to limp. The speed and possibilities of the journey will be different.

Integrating the traction of theory in conjunction with the inertia generated by evidence-based research is not an option but a necessity to consolidate music therapy as a clinical and academic discipline. The theory is the centre of gravity; it is the axis on which the system rests. Research is the energy that gives life to the muscles and joints. Together, they multiply music's transformative capacity because they provide us with arguments to define the therapeutic scope of any of our actions.

Understanding why any of the manifestations of well-being occur in sessions allows us to advise and ensure a more direct path to consolidating such results. We have gained much with our practice models. Instead of approaching the person from the perspective of their illness or their deficiency, we know how to view them from the foundation of their humanity. This allows us to work without the urgency of haste and to dialogue with the symptoms and their essential need. Why not do so with the security of an integrated system in which all the pieces fit together and support each other?

Let us look for points of convergence between doing and understanding, between bringing out the musicality in people and knowing where we do it in order to control its effect and impact. By giving meaning to sound, we emphasize the therapeutic effect and thus legitimize the adopted clinical framework. This helps us know which side of science we should be on. In this way, we avoid wandering into places our discipline is not qualified to go.

By understanding the nature of knowledge in music therapy, we will know how to detect the essential steps to respond to patient demands, uncover the essential research problems, and undertake dynamics to resolve them. We will achieve this the day we, as a collective, understand that practice based on empirical evidence guarantees better services for people. Once we are up, let us use both legs to activate the entire therapeutic body and fully direct it toward the integral cause of transforming lives through music.

Let us not renounce scientific and theoretical rigour along the way; let us seek causality and be open to experience. Let us tread firmly into the naturalistic realm,

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TABLE OF CONTENTS

AUTHORS

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ARTIFICIAL INTELLIGENCE IN MUSIC THERAPY: A NEW ERA OF PERSONALIZED CARE AND SCALABLE IMPACTS

Inteligencia artificial en musicoterapia: una nueva era de atención personalizada e impactos escalables

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Dr. Petra Kern field tested and presented aspects of this content at the University of Music and Performing Arts in Austria, Liepãjas University in Latvia, and #Digitarthe.org. AI tools were utilized for text editing and language translation.
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Informed consent was secured from all participants and their guardians displayed in the field test.

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Abstract
Artificial Intelligence (AI) has quickly permeated various professional fields, including creative and therapeutic disciplines. In music therapy, AI provides tools that can augment traditional practices through enhanced workflows, creativity, personalized interventions, and data-driven insights. This article explores the potential of AI in music therapy, detailing its applications across planning, implementation, and evaluation phases. Trending AI technologies for generating text, images, music, and videos, that enrich therapy by tailoring interventions to diverse populations and individual client needs, are introduced. Selection criteria are outlined to guide music therapists in choosing appropriate tools for their practice. As an example, the e-book *Pippin the Piano* demonstrates how AI can generate valuable clinical resources. A field test highlights how the AI-generated materials complement telepractice through dynamic storytelling and interactive engagement while maintaining the therapist's central role in guiding therapy and building meaningful connections. Ultimately, AI holds significant promise for innovative therapeutic practices, but its integration requires digital skills, ethical awareness, and must adhered to professional standards. Therefore, an initial framework of core competencies is presented to guide music therapists in navigating these challenges. In conclusion, thoughtfully incorporating AI enables therapists to expand accessibility, inclusivity, and impact, while remaining competitive in an AI-driven job market.

Keywords: artificial intelligence, music therapy practice, personalized care

Resumen
La Inteligencia Artificial (IA) ha irrumpido rápidamente en diversos campos profesionales, incluyendo disciplinas creativas y terapéuticas. En la musicoterapia, la IA proporciona herramientas que complementan las prácticas tradicionales mediante la optimización de flujos de trabajo, el fomento de la creatividad, la personalización de intervenciones y el análisis basado en datos. Este artículo explora el potencial de la IA en la musicoterapia, detallando sus aplicaciones en las fases de planificación, implementación y evaluación. Se presentan tecnologías de IA emergentes para la generación de texto, imágenes, música y videos, las cuales enriquecen la terapia al adaptar las intervenciones a diversas poblaciones y necesidades individuales. Además, se describen criterios de selección para guiar a los musicoterapeutas en la elección de herramientas adecuadas para su práctica. Como ejemplo, el libro electrónico *Pippin the Piano* demuestra cómo la IA puede generar valiosos recursos clínicos. Un estudio de campo destaca cómo los materiales generados por IA complementan la telepráctica a través de narrativas dinámicas e interacciones participativas, preservando el rol central del terapeuta en la guía del proceso terapéutico y la construcción de conexiones significativas. En última instancia, la IA ofrece un gran potencial para prácticas terapéuticas innovadoras, pero su integración exige competencias digitales, conciencia ética y apego a estándares profesionales. Por ello, se presenta un marco inicial de competencias clave para orientar a los musicoterapeutas en estos desafíos. En conclusión, la integración reflexiva de la IA permite a los terapeutas ampliar la accesibilidad, la inclusividad y el impacto, al tiempo que se mantienen competitivos en un mercado laboral impulsado por la IA

Palabras clave: inteligencia artificial, práctica de la musicoterapia, atención personalizada.

INTRODUCTION

The evolution of artificial intelligence – from rules to creativity

Envision a world where machines compose music, craft poetry, and adapt to a person's unique ways of learning – all while enhancing the human experience. This is no longer science fiction but reality, thanks to Artificial Intelligence (AI). From its humble beginnings as systems designed to follow programmed rules, AI has transformed into a powerful force capable of simulating human-like intelligence. It learns from data, finds patterns, makes decisions, and performs actions, pushing the boundaries of what technology can achieve. The revolution began with "machine learning," a breakthrough where AI systems no longer needed humans to hand-feed them rules. Instead, they began to train themselves, uncovering insights buried in massive datasets. Search engines like Google epitomize this leap, predicting individual needs and preferences with remarkable accuracy. Similarly, "adaptive learning systems" like Duolingo use AI to adjust lesson content in real-time, creating personalized educational experiences. But AI didn't stop there! With advances in "natural language processing (NLP)," machines began to understand, interpret, and even converse in human language. Tools like Siri and Alexa blurred the lines between assistant and companion, bringing conversational AI into everyday live. The most dramatic shift came in November 2022, when "generative AI" changed the game. Tools like ChatGPT and Google Bard (now Gemini) introduced the world to large language models (LLMs) that could generate human-like text, music, images, videos, and more, simply by learning patterns from data when specifically prompted by humans. Suddenly, AI was not just a tool – it became a collaborator, unlocking creative possibilities that seemed unimaginable just a few years ago (Kaul et al., 2020; Ruiz & Fusco, 2023; UNESCO, 2020; UTSouthwestern Medical Center, 2025).

ChatGPT, where GPT stands for "Generative Pre-trained Transformer," is currently one of the most well-known examples of LLMs. But how does it work? Imagine asking, "Explain ChatGPT to a preschooler" The model processes this prompt by breaking it down and analyzing the context based on everything it has learned from massive amounts of text data, such as books, websites, and articles. It then predicts the next words in the response to form a meaningful and coherent explanation, like this: "ChatGPT is like a robot that knows a lot of words and can talk to you. You ask it a question, and it tries its best to give you a smart answer." However, the data LLMs are trained on is not perfect. It comes from publicly available sources, which means it might contain errors, outdated information, or even biases. These limitations can affect the quality and fairness of the model's responses. Additionally, LLMs don't "think" or "understand" like humans—they predict words based on patterns, not personal experiences or reasoning. A simplified view of how ChatGPT improves its answers is through a process called reinforcement learning. For example, if multiple responses are generated to "Explain ChatGPT to a preschooler," a system evaluates which answer is the most accurate and helpful. This feedback helps the model learn to create better responses in the future (Diaz, 2024; OpenAI, 2022; So, 2024).

Looking toward the future, "autonomiouse AI systems" (e.g., an automated agent) loom on the horizon, capable of autonomously adapting, improving, and functioning with minimal human input. While advancements hold immense potential for creative and therapeutic fields, their capabilities should always be used with care, especially in sensitive areas like healthcare, where accuracy, fairness, and context are essential. Yet, one thing is clear: AI is reshaping the way therapists work – leading in a new era of personalized care and scalable impacts.

AI in healthcare – transforming practice and efficiency

AI is becoming an integral part of medical healthcare, improving diagnostics, treatment strategies, and patient care. Its ability to analyze large datasets such as medical records, imaging studies, and laboratory results and identify intricate patterns enables physicians to make better-informed decisions and therefore improve patient outcomes. In addition, AI has the capability to empower patients through personalized health information, remote monitoring, virtual consultations, improved medication management, and increased transparency enabling earlier interventions, better health outcomes, enhanced patient engagement (Dave & Patel, 2023).

In psychiatry, the role of AI is increasingly promising by enhancing diagnostic accuracy, providing more personalized interventions, and improving accessibility, particularly for underserved populations. The American Psychological Association (APAa, 2024) underscores the growing integration of AI-powered tools into clinical practice tasks like seamless patient intake, tailored treatment plans, tracking session data, patient monitoring, or comprehensive handouts. AI tools are transforming administrative workflows by generating progress notes, automating client reminders, and data-based reports, enabling clinicians to devote more time to direct patient interactions. LLMs and wearable technology are paving the way for automated interactive conversations and preliminary patient assessments for depression, suicide risk, and other issues (Abrams, 2025; Ly et al., 2017). While current iterations lack the clinical reasoning and empathy required for direct therapeutic interactions, future advancements may incorporate emotion recognition, personality assessments, and mental health risk detection. For instance, AI systems

may eventually analyze social media interactions or text exchanges to detect cognitive distortions and identify risks of mental health crises (Cheng et al., 2023).

Yet, the integration of AI into medical and mental healthcare is not without challenges. Ethical concerns surrounding data privacy, algorithmic bias, patient autonomy, and over-reliance on AI remain critical issues. It is essential to verify AI-generated content for clinical accuracy while addressing its limitations, such as contextual misunderstandings and occasional inaccuracies. Ensuring responsible and effective implementation requires careful evaluation and adherence to ethical guidelines (Abrams, 2024; APA, 2024a; Dave & Patel, 2023; Ly et al., 2017; Cheng et al., 2023).

AI in music therapy – bridging creativity and technology

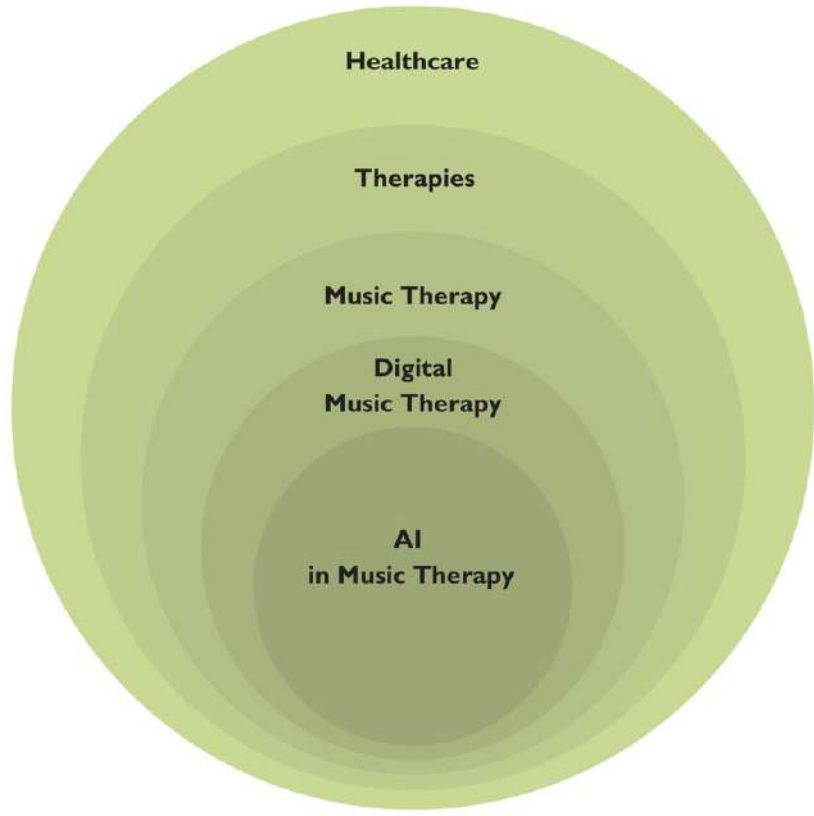
While digital music technologies, assistive technologies, virtual and augmented reality tools are steadily advancing in varied music therapy settings (Partesotti & Magee, 2025; Swanson, 2023) the adoption and application of AI in music therapy practice is slowly emerging. However, AI-driven systems hold potential for cultivating greater accessibility, inclusivity, and equity in music therapy. Additionally, generative AI tools like ChatGPT have opened new avenues for enhanced creativity, personalized client engagement, and improved data-based progress tracking (Kern, 2023; Kern, 2024c).

As Geipel and Jordan (2024) reported in their exploratory self-study, ChatGPT can assist music therapists in songwriting, personalized fantasy stories, and generating playlists. Similarly, Stegemann and Weymann (2024) found in their brief survey potential applications of AI in reducing administrative tasks, generating playlists tailored to client's preferences, or analyzing clients' responses to music. Their preliminary findings, however, underscored concerns about ethical implications and training gaps, emphasizing the need for both comprehensive education and ethical frameworks in AI integration. Furthermore, Sun et al. (2024) highlighted that co-designing AI tools with music therapists could improve therapeutic outcomes by aligning applications with clinical goals, enhancing real-time feedback, and maintaining the human-centered values of therapy.

Despite these hurdles, AI in music therapy provides an untapped opportunity to complement the expertise of music therapists, serving as a bridge between human creativity and advanced technology. It can serve as a catalyst for innovation, create tailored content, streamline workflows, and allowing professionals more focus on client interaction, while leveraging technology for support. By enabling adaptive interventions and providing data-driven insights, AI can empower music therapists to design more personalized and impactful therapeutic experiences. Figure 1 illustrates the integration of AI into music therapy practice within the broader context of healthcare.

Figure 1

AI in music therapy practice in context of healthcare



Note: This figure illustrates the relationship between AI in music therapy practice and the healthcare sector.

Prepared by the author.

APPLICATION OF AI IN MUSIC THERAPY PRACTICE

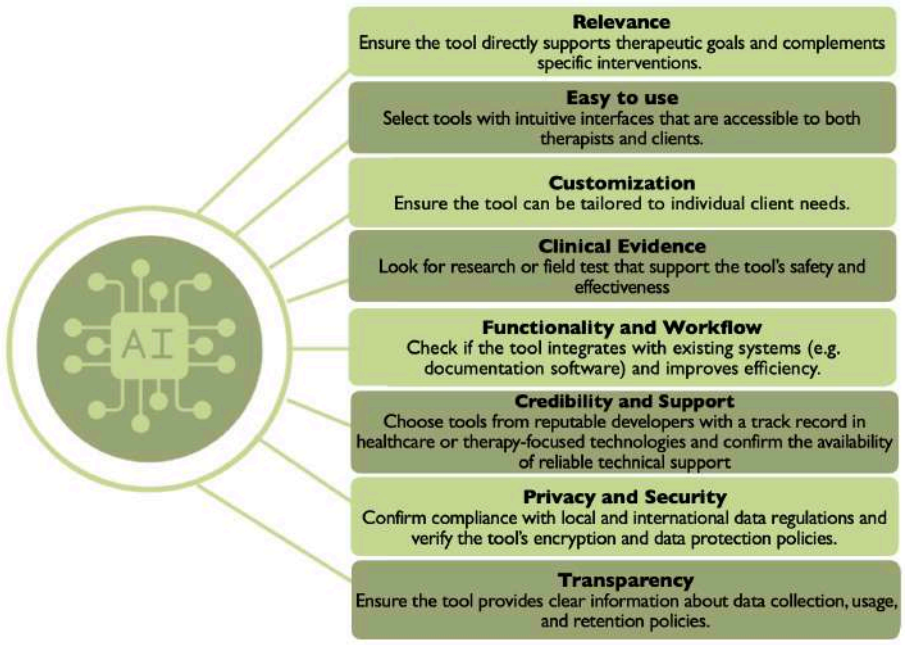
Tools for transforming care

AI tools have revolutionized the way professionals approach tasks across various domains, from writing and productivity to research, programming, and even lifestyle optimization. They can be accessed through many platforms (e.g., App Stores, Marketplaces) or found inside commonly used software (e.g., Canva with its AI-driven design features). For music therapists, these tools provide an opportunity to streamline workflows, enhance services, and ultimately elevate client care. However, with the exponential growth of AI-driven systems, choosing the right tools can be daunting. The rapid pace of development means therapists must evaluate tools thoughtfully to ensure they align with clinical needs and ethical standards.

Selecting the best AI tools requires more than just curiosity – it demands a clear understanding of the tool's capabilities and how it fits into therapeutic practice. Familiarity with AI platforms and identifying where they add value to therapy services takes time but is essential to ensure that their integration benefits both therapists and clients. By following the practical yet non-exhaustive guidelines, adapted from the American Psychological Association (2024b in Figure 2), music therapists can make well-informed decisions about selecting AI tools for their practice.

Figure 2

Selection criteria for AI tools



Note: This figure displays criteria for choosing effective and ethical sound AI tools for music therapy practice.

Adapted from APA (2024b) by the author.

Generative AI in music therapy

Integrating generative AI into music therapy practice offers new capabilities across key phases of practice: planning, implementing, and evaluating interventions. In recent years, AI tools have advanced significantly, enabling the creation of text, images, music, and video content from simple text prompts. Beyond text input, other prompt methods such as voice commands, scanned documents, existing music samples, and even client-generated artwork (OpenAI, 2025) can now be utilized to develop personalized, engaging, and accessible therapeutic materials. Whether streamlining administrative tasks, crafting a therapeutic song, designing visual aids, or generating customized music, these tools empower music therapists to enhance their sessions with innovative and client-preferred resources.

Table 1

Trending AI tools enhancing music therapy practice

Tools (generating text, images, music, and videos)	**Planning** (producing input and ideas)	**Implementing** (offering personalized client engagement)	**Evaluating** (using data-based progress tracking)
Text (e.g., ChatGPT 4o, Gemini, Grok 3)	- Get summary information about diagnosis, assessment tools, or EBP interventions - Draft goals/ objectives, intervention or session plans - Check equipment, materials, apps, or AI tools - Send automatic intake and consent forms or client reminders	- Curate client-preferred music playlists - Write song lyrics and chord progressions - Create social stories - Apply language translation into clients' primary language	- Create evaluation forms - Generate progress notes - Send data-based reports - Turn reports or messages for clients into plain language
Image (e.g., DALL-E3, Canva-Dream Lab, Gemini image Gen 3)	- Design personalized visual schedules, or mood charts - Create visual supports for activities such as music-assisted relaxation or guided imagery	- Share imagery like conveying dreams or emotions - Create visual storyboards	- Use mood-tracking charts - Identify patterns in client's visual work
Music (e.g., MusicGen, Amber Music, AI AIVA)	- Generate copyright-free music - Create paced and timed music to guide movements	- Create client-preferred rhythm loops, soundtracks, or music compositions - Transform client-specific content into music	- Use auditory tracking for client responses - Identify patterns in client's auditory work
Video (e.g., Powetoon imagine, Veo 2, Sora)	- Create engaging and personalized videos modeling examples for clients - Generate animated explainer videos or interactive learning models for caregivers - Produce multimedia-enriched videos for advocacy or marketing therapeutic services	- Use video during session to model behaviors or demonstrate step-by-step guides - Share explainer videos with caregivers and communities - Publish a marketing video on social media platforms	- Analyze client behavior with video content - Identify patterns in client's facial expression

Note: This table presents AI tools designed to generate input and ideas, facilitate personalized client engagement, and support data-driven progress tracking throughout key phases of the therapeutic process (Kern, 2024a, 2024b, 2024c).

Table 1 presents trending generative AI tools for text, image, music, and video creation. These tools offer practical applications for generating input and ideas for session planning, personalized client engagement during session implementation, and data-based progress tracking for evaluation. While the list highlights tools used in the field, the rapid pace of AI

development means new tools are emerging regularly and likely are to be integrated into everyday software and services. Music therapists are encouraged to stay informed about the latest innovations and refer to the selection criteria when exploring new AI tools. Being open to technological advancements ensures music therapists can integrate the best tools into their practice, supporting meaningful and effective therapeutic outcomes.

AI project – *Pippin the Piano*

In early 2024, the e-book *Pippin the Piano* emerged as a creative exploration of the relevance, capacity, and functionality of popular AI tools, including ChatGPT, DALL · E, MusicGen, and Canva. The project utilized free versions of these tools available at the time to evaluate their potential for creating goal-oriented materials for clinical use with young children of various abilities. Inspired by the author's personal experience of relocating a childhood piano from Germany to Italy, the story weaves a cultural and musical adventure that concludes with a meaningful lesson and moral.

For clinical application, the e-book is supplemented with a detailed, music-mediated intervention guide outlining how each page of the book could be utilized in practice. The session framework includes age-appropriate music and movement activities that music therapists, early childhood educators, or parents can implement in diverse settings. The story is crafted to address three developmental goals:

1. Enhancing literacy skills (i.e., supporting vocabulary acquisition, comprehension, and story recall).
2. Facilitating narrative engagement (i.e., encouraging active participation and connection with the storyline).
3. Promoting cultural interest and imagination (i.e., inspiring curiosity about different cultures and fostering creative thinking).

Detailed objectives and measurement strategies as well as a documentation form make it easy for professionals to track children's individual progress towards these goals. The project development summarized in Table 2, outlines how common generative AI tools were integrated to generate text, images, and music.

Field test – Early childhood telepractice session

To evaluate the practical application of AI-generated music therapy resources, a telepractice session was conducted within an inclusive preschool classroom in North Carolina. The session involved five children and their classroom teacher, participating in a 30-minute online session delivered via Zoom.

Table 2

Steps and generative AI tools used to create Pippin the Piano

Steps	AI Tool	Content Description	Task or Sample Prompt
Idea Development	None (Author's Input)	Conceptualized storyline, designed music-mediated intervention, identified developmental areas and progress tracking.	- Develop a storyline about a piano's farewell in Germany, traveling through cultural adventures, and finding a new home.
Text Creation	ChatGPT	Generated text segments, refined language, session outline, goals/ objectives, and evaluation forms.	- "Rewrite the following text in an engaging and child-friendly way."
Images Generation	DALL · E	Created unique watercolor-style illustrations for each scenario in the story.	- "Generate a watercolor image of a vintage Volkswagen bus in blue and gray driving through the Alps."
Music Creation	MusicGen	Produced copyright-free, culturally inspired music to accompany the story and session.	- "Create a traditional German folk dance tune from the Allgäu region with lively rhythms and cheerful melodies."
Video Production	Canva	Created animated multimedia slides for the e-book, translated it into German and Italian, and converted the e-book into multiple formats.	- Translate the e-book into German and Italian and convert each version into an autoplay MP4 video.
Approval and Refinement	None (Author's Input)	Validated the accuracy of AI-generated outputs and alignment with therapeutic goals and measurements, ensured cultural appropriateness, and mitigated biases.	- Review and adjust all content for quality, inclusivity and client-centered relevance.

Note: This table outlines the steps and generative AI tools used in developing the ebook Pippin the Piano, designed for early childhood music therapy practice. From Kern (2024d).

The e-book *Pippin the Piano* served as the central resource. The author facilitated the session by visually sharing the story illustrations created with DALL · E, narrating the text developed using ChatGPT, playing AI-composed music loops from MusicGen, while engaging the children through instrument play, vocal exploration, movement activities, and open-ended questions. The classroom teacher provided essential on-site support by modeling tasks, distributing instruments, assisting children with self-expression, and tracking their progress throughout the session.

Clinical observations revealed that all children participated actively in the session. Examples of engagement included joyful yodeling, flowing scarf movements, and rhythmic tapping to the AI-generated music. The children demonstrated emerging cultural awareness by asking questions such as, "Do you need to fly on an airplane to Italy?" and identifying another language when discussing the phrase, "Gute Reise, Pippin." While the children easily recalled the cow's name from the story, their comprehension of the broader narrative was less clear. However, repetition is a cornerstone of early learning, and the e-book allows educators to revisit the music-animated story in subsequent days. The early childhood educator provided positive feedback, noting: "I think the book is very interactive, and I love the sound effects that accompany the story. The explanation and teacher notes at the end are very helpful, although I did need to look up how to pronounce the region where the cows live. Lol."

This field test underscores the capability of AI-generated materials to enhance therapeutic sessions with dynamic, culturally engaging content, fostering meaningful interactions and measurable outcomes. Figure 3 features two QR codes: with AI-narrated autoplay video of the e-book, while the other provides a three-minute capture of the telepractice session, showcasing how the AI-generated resource was implemented in practice. Readers are encouraged to explore the session documentation form included in the e-book, which allows them to evaluate children's progress across the identified developmental goals.

Figure 3
Project: Pippin the Piano

Note: This figure includes QR codes linking to an autoplay video of the e-book and a telepractice session capture, illustrating the use of AI-generated materials in therapy. From Kern (2024d).

COMPETENCIES FOR MUSIC THERAPISTS IN AN AI-DRIVEN HEALTH SECTOR

Core competencies for navigating AI-enhanced therapeutic practices

As AI systems continue to shape healthcare and the job market, music therapists must be flexible and ready to acquire new skills to integrate AI technologies effectively into their practice. By gaining critical AI competencies, music therapists can effectively navigate an AI-driven health sector while maintaining the human-centered essence of their practice. The following list tailored to music therapists from various sources (e.g., APA 2024c; European Union, 2024; Kern, 2024a, b, c; UNESCO, 2024), outlines an initial framework of core competences essential for maintaining the therapeutic relationship, ensuring ethical AI application, and maximizing its potential to enhance care.

1. Digital Literacy and AI Familiarity
   - Develop a clear understanding of the principles of artificial intelligence, including machine learning and natural language processing (NLP).
   - Gain expertise in operating AI-powered tools and adaptive analytics platforms to enhance therapeutic practices.
   - Stay informed about data privacy standards and implement cybersecurity measures to ensure safe navigation of AI systems.
2. Creative and Flexible Integration of AI
   - Use accessible, inclusive, and culturally sensitive AI tools for creative tasks and adapt AI-generated outputs to client-specific needs, cultural context, and therapeutic goals.
   - Incorporate AI technologies into hybrid therapy models and seamlessly blend traditional with digital services.
   - Avoid over-reliance on AI to maintain the music therapist's role as the primary creative driver.
3. Data Analysis and Interpretation
   - Analyze AI-generated data and identify patterns to track client progress.
   - Interpret AI-generated data for personalizing interventions.
   - Be cautious of biases inherent in AI data and ensure decisions prioritizing client well-being.
4. Ethical Considerations
   - Apply established ethical guidelines and comply with country-specific regulations governing the use of AI in therapy.

- Safeguard client data by ensuring robust privacy protections and obtaining informed consent before incorporating AI tools into therapeutic practices.
- Identify and address biases in AI systems to ensure equity and inclusivity in their outputs and applications.
- Advocate for the transparent use of AI in music therapy and maintaining accountability for decisions influenced by AI systems.

5. Client-Centered Adaptability
   - Maintain a strong human connection by balancing AI-driven efficiencies with empathetic and responsive care.
   - Educate clients about the role of AI in music therapy and address any concerns they may have.
   - Ensure clients retain agency and choice in their therapeutic process.
6. Time Management and Workflow Optimization
   - Identify areas where AI can reduce workload and improve efficiency, enabling music therapists to focus on direct client care.
   - Use AI to streamline administrative tasks such as scheduling, session notes, and documentation.
   - Ensure that automation does not compromises the quality of music therapy services.
7. AI-Specific Training and Professional Development
   - Stay informed on advancements in AI technologies relevant to music therapy.
   - Learn to troubleshoot, adapt, and refine AI tools to optimize their therapeutic use.
   - Collaborate with AI developers to provide feedback and improve tools tailored to music therapy.
8. Advocacy and Leadership
   - Support music therapy within the context of an increasingly AI-driven healthcare sector.
   - Advocate for accessible AI technologies that enhance inclusivity in music therapy settings.
   - Shape policies and best practices for AI adoption in music therapy.

Emerging professional roles in AI-driven music therapy

The rise of AI and digital tools in music therapy has created a range of specialized roles that demand a blend of therapeutic expertise and technological proficiency. These roles provide novel opportunities for music therapists to expand their practice into innovative areas such as digital health, content creation, and remote therapy services. Table 3 highlights key job roles, responsibilities, and potential companies leading the evolution (Kern, 2024b). This preliminary information is designed to help music therapists confidently navigate the growing digital job market in healthcare while aligning their skills with contemporary professional demands.

Table 3

New job opportunities in digital music therapy

Role	Task Description	Key Responsibilities	Potential Companies
Remote Music Therapy Services	Deliver music therapy sessions online, using AI to create personalized interventions and monitor client progress.	Conduct individual and group sessions, ensure client engagement, analyze progress using AI tools.	BetterHelp, TalkSpace, SimplePractice, Zoom, MusicTherapyEd, TheraNest
Tech Consulting for Music-Based Therapeutic Tools	Advising on digital tools for music therapy, including AI-powered applications.	Collaborate with developers, provide therapeutic insights, test AI-enhanced tools, and ensure usability and relevance.	Ableton, AUMI, SoundBeam, ChatGPT, LullaFeed, Digital Therapeutic Alliance, Apple
Research in Digital Therapy Innovations	Conduct studies to validate AI-powered digital tools and their impact on therapeutic outcomes.	Design research studies, analyze AI-generated data, and publish findings to inform evidence-based practices.	Berklee College of Music, Mayo Clinic, National Institutes of Health, JMIR Mental Health
Digital Health Content Creation	Create educational resources and tutorials integrating AI for client and therapist use.	Develop AI-driven interactive programs, write articles, and produce video tutorials for digital platforms.	Udemy, Coursera, Patreon, Skillshare
Advocacy and Policy Development	Advocate for the integration of AI-driven music therapy tools in healthcare policies and practices.	Collaborate with policymakers, develop guidelines for ethical AI use, and participate in advocacy groups.	Music & Memory, American Telemedicine Association, European Music Therapy Confederation
Digital Therapeutics Specialist	Integrate AI-driven therapeutic solutions into personalized patient care plans.	Implement AI-powered tools, collaborate with healthcare teams, monitor patient outcomes using digital metrics.	Music & Memory, Happify Health, Better Therapeutics, American Telemedicine Association

Note: This table highlights new opportunities for music therapists seeking to enter or expand their practice in an AI-driven healthcare sector.

From Kern (2024b).

CONCLUSION

AI in music therapy creates a unique intersection where human creativity and technological advancements come together to expand therapeutic possibilities. By thoughtfully embracing this technology, music therapists can enhance their practice with innovative tools while preserving the human-centered essence of their work. As AI continues to evolve, its integration must be guided by robust ethical frameworks and a unwavering commitment to the well-being of clients. Looking ahead, Artificial Intelligence in Music Therapy: A New Era of Personalized Care and Scalable Impacts signals a transformative development, where the boundaries of therapeutic innovation are limited only by imagination.

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TECHNOLOGY GENERATES NEW THERAPEUTIC POSIBILITIES

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#9,2

THE IMPACT OF SONGWRITING ON THE QUALITY OF LIFE OF ADULTS WITH INTELLECTUAL DISABILITIES

Impacto del *songwriting* en la calidad de vida de personas adultas con discapacidad intelectual

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ABSTRACT

Background. The applications of music therapy have been studied in people with special educational needs. However, there is a lack of studies that use songwriting techniques to improve interpersonal relationships and routine tasks in people with intellectual disabilities in sheltered housing. **Participants.** Five adults with intellectual disabilities, aged 28 to 47 years (M 34.6; SD = 8.76), 40% women, participated with informed consent signed by their legal guardians. **Methodology.** Sixteen music therapy sessions were held twice a week, 60 minutes each, using songwriting techniques with a humanistic approach. The Wilcoxon test was used to measure pre- and post-test differences, and a one-factor ANOVA with repeated measures was used to analyze significant differences between different variables. **Results.** Wilcoxon's test showed post values (Mdn = 4) higher than the pre values (Mdn = 3) but without statistical significance (p = .32). The one-factor ANOVA revealed significant differences between variables, benefiting young people more (F= 73.6, p< .001; η2p= 0.95). There were no significant differences by sex or interaction between sex and age (p= .50 and p= .38, respectively). **Conclusions.** Songwriting techniques did not show substantial differences in pre-and post-test measures, but they did improve certain variables, especially in the youngest. No significant differences were found by sex, indicating that the benefits of music therapy depend more on age than gender.

Keywords: music therapy, intellectual disability, songwriting, routine tasks, interpersonal relationships.

RESUMEN

Antecedentes. Las aplicaciones de la musicoterapia han sido estudiadas en personas con necesidades educativas especiales. Sin embargo, faltan estudios que usen técnicas de *songwriting* para mejorar relaciones interpersonales y tareas rutinarias en personas con discapacidad intelectual en viviendas tuteladas. **Participantes.** Cinco adultos con discapacidad intelectual, edades entre 28 y 47 años (M= 34.6; DT= 8.76), 40% mujeres, participaron con consentimiento informado y firmado por sus tutores legales. **Metodología.** Se realizaron 16 sesiones de musicoterapia, dos veces por semana, de 60 minutos cada una, usando técnicas de songwriting con un enfoque humanista. Se empleó la prueba de Wilcoxon para medir diferencias pre y post test, y un ANOVA de un factor con medidas repetidas para analizar diferencias significativas entre distintas variables. **Resultados.** La prueba de Wilcoxon mostró valores post (Mdn= 4) mayores que los pre (Mdn= 3), pero sin significancia estadística (p= .32). El ANOVA de un factor reveló diferencias significativas entre variables, beneficiando más a los jóvenes (F= 73.6, p< .001; η2p= 0.95). No hubo diferencias significativas por sexo ni interacción entre sexo y edad (p= .50 y p= .38, respectivamente). **Conclusiones.** Las técnicas de songwriting no mostraron diferencias significativas en medidas pre y post test, pero sí mejoraron ciertas variables, especialmente en los más jóvenes. No se encontraron diferencias significativas por sexo, indicando que los beneficios de la musicoterapia dependen más de la edad que del género.

Palabras clave: musicoterapia, discapacidad intelectual, songwriting, tareas rutinarias, relaciones interpersonales.

INTRODUCTION

Although the applications of music therapy have been widely studied (Fernández-Company *et al.*, 2024; Freitas *et al.*, 2022; Nevado-Minaya & Fernández-Company, 2022; Sihvonen et al., 2017), specifically with people with special educational needs (Curatola *et al.*, 2020; Jacob *et al.*, 2021; Majul-Villarreal & Fernández-Company, 2020), as far as we know, no studies have been carried out through music therapy interventions based on songwriting techniques aimed at improving interpersonal relationships and routine tasks of people with intellectual disabilities living in a sheltered home.

People with intellectual disabilities may have difficulties in autonomy, problem-solving, and social interaction with others (Hagilassis & Di Marco, 2015). Therefore, it is necessary to generate and manage the necessary support for people with disabilities to develop their quality of life in all its dimensions: emotional well-being, interpersonal relationships, material well-being, physical well-being, personal development, self-determination, social Inclusion and rights (Schalock & Verdugo, 2007).

From this point of view, quality of life increases when people are empowered to participate in decisions that affect their lives and when there is full acceptance and integration into the community.

Full Inclusion (2022) proposes deinstitutionalization as a process to change from the model of institutions to support the community through the provision of support and services that respect their rights and preferences. The aim is to guarantee the right of people with disabilities to choose how they want to live their lives.

In this sense, home music therapy interventions have been explored with the aim of improving this quality. A recent study investigated how a music therapy intervention positively influences relationship quality in couples with dementia. Despite not finding a statistically significant effect in the quantitative analysis, it was observed that the quality of the relationship remained stable during the intervention period.

In addition, this research revealed that music therapy generated positive emotions, closeness, intimacy, and better communication between participants, although it could also elicit negative emotional responses (Stedje *et al.*, 2023). From this perspective, music is widely considered a highly effective stimulus for evoking emotions (García-Rodríguez *et al.*, 2021; 2023).

On the other hand, music therapy has been shown to be beneficial for people with intellectual disabilities. A recent systematic review found that this therapy is effective for diagnostic and therapeutic purposes and for improving parent-child interaction (Applewhite *et al.*, 2022).

In addition, another study concluded that musical interventions in young people with intellectual disabilities facilitate the development of functional skills and promote social participation (Després *et al.*, 2024). However, the need to focus more on aspects such as self-determination and creativity, which can encourage greater involvement of young people in these activities, is highlighted.

Music therapy has also proven to be a valuable tool in the field of developmental disorders. Research in special education classrooms showed improvements in the verbal responsiveness of children with autism and intellectual disability (Mendelson *et al.*, 2016). Likewise, another study examined the effectiveness of group music therapy in improving social skills in children with autism, finding improvements in joint attention and eye contact (LaGasse, 2014).

In the educational field, music therapy interventions in inclusive environments have been shown to be effective in improving social skills. A review of studies highlighted the need to expand research in this field and to develop teaching strategies that promote the Inclusion of students with and without disabilities (Jellison & Draper, 2015). In addition, a study based on action research methods managed to improve the interaction between students with severe disabilities and their peers through musical activities (Draper *et al.*, 2019).

Social connectivity and music therapy have also been explored in young people with disabilities. Some studies have pointed to a lack of collaboration and the use of outdated models in the existing literature. However, community music therapy programs have shown significant benefits in understanding and mutual support among young people in adverse situations (Murphy & McFerran, 2017; McFerran & Hunt, 2022).

In this sense, the importance of designing activities that promote the Inclusion of these young people in the university community and other social environments has been highlighted (Rickson & Warren, 2018).

Music therapy in school counselling is emerging as a significant practice. A recently developed protocol emphasizes the importance of collaborative relationships and ecological assessment, showing that musical activities can improve the relationships and development of students with disabilities (Rickson, 2010).

This approach not only highlights students' strengths but also motivates and energizes members of the educational team, allowing them to continue using musical strategies after the music therapist's intervention.

Finally, other studies have explored the application of music therapy in various contexts, such as medical and educational settings. Recent research in a residence for people with disabilities showed that music therapy significantly improves participants' quality of life by improving their emotional expression and social interaction (Tezza, 2023). This study highlights the importance of creating environments that promote the self-determination and active participation of persons with disabilities, moving away from traditional institutional practices.

In summary, music therapy emerges as a powerful and versatile tool that can improve the quality of life for diverse populations, from couples with dementia to young people with intellectual disabilities and children with developmental disorders.

Research continues to demonstrate its benefits in multiple areas, although it also underlines the need to continue exploring and expanding its application to maximize its positive impact.

MATERIALS AND METHOD

Participants

Five adults with intellectual disabilities aged between 28 and 47 participated in the study, with prior informed consent signed by the participants' legal guardians (M 34.6; SD = 8.76), of which 40% (2) were women.

The group has been made up of people with intellectual disabilities: three with Down syndrome (one of them with autistic symptoms), one person with Angelman syndrome and another with Cornelia de Lange syndrome.

Participation in this study has been disinterested, anonymous and voluntary on the part of the intervening persons. The sample used in our research is intentional since the subjects were not chosen following the laws of chance but in some way intentionally (Orús & Conte, 2010).

Incentives and measures

Stimuli. The project was developed using carefully selected sound-musical stimuli to enhance the motivation and active participation of the beneficiaries. In line with the recommendations of Mateos-Hernández (2004), musical stimuli were designed to be attractive and safe, avoiding any material that could pose a physical risk.

The instruments used included both natural resources, including the human body, which was used as a sound tool through body percussion and voice, and conventional instruments, including the piano, guitar, and flute.

Percussion instruments with determined and indeterminate pitches were also used, including boomwhackers, bass drums, bells, maracas, tambourines and xylophones.

The musical environment played a crucial role, supported by technological tools such as a laptop with the programs "ProTools" and "Kontakt", which facilitated the recording, editing and choice of musical styles.

These tools allowed participants to experiment with different genres, such as classical, pop, rock, jazz, country, electronica, and reggae, before collectively deciding on the styles of the songs created. In addition, 5 cm size pictograms were used to represent keywords related to the beneficiaries' daily routines, thus facilitating understanding and inclusive participation in the creative process.

Measurement. The study used a combination of quantitative and qualitative measures to assess the impact of musical interventions on beneficiaries. Questionnaires designed specifically for each of the songs created during the project, "Un nuevo amanecer" and "Cepilla, cepilla", were used. Both questionnaires were applied before and after the intervention, allowing an initial and a final evaluation to be carried out to observe the changes produced.

The quantitative measures included closed-ended questions with Likert-type scales that assessed aspects such as mood, perception of energy level, and characteristics of behaviour related to the specific routines associated with each song.

These scales facilitated statistical analysis of the data and provided insight into overall trends and patterns among participants. For example, in the case of the song "Un Nuevo Amanecer," responses were analyzed in terms of changes in mood and perceived difficulty in waking up. In contrast, for "Brush, brush," variables related to time spent brushing, quality of brushing, and perceived comfort level during this activity were included.

To enrich the analysis and gain a deeper understanding, open-ended questions were included in the questionnaires, where beneficiaries and caregivers could express their perceptions, experiences, and suggestions related to the interventions. These qualitative responses provided a broader context to the quantitative results and allowed the identification of subjective and emotional aspects of the songs' impact.

Procedure

During the project's development, 16 group music therapy sessions were carried out. These sessions took place twice a

week between April 8 and May 30, 2024 and were developed following the seven-phase intervention model designed by Mateos-Hernández (2004). The participatory methodology applied favoured the beneficiaries' active participation in all the activities. The sessions began with a dynamic introduction and progressed to improvisation exercises, music-making, and group relationship activities through music.

A key aspect was the collective composition of two songs, "Un Nuevo Amanecer" and "Cepilla, cepilla," specifically designed to support the participants' daily routines. Before the composition, the objective of the project was explained to the beneficiaries and through pictograms, they were facilitated to select words related to their experiences.

The words chosen by the group reflected significant aspects of their daily activities, such as "sun," "tooth," "wash," and "smile." From these words, the lyrics and melodies were created in a collaborative process, with participants also selecting the musical styles that best represented each song: reggae for "Un nuevo amanecer" and rock for "Cepilla, cepilla."

Subsequently, the songs were integrated into the daily routines of the residents of the sheltered housing, focusing on two activities that required special attention as agreed with the centre coordinator: the reduction of the time needed to get up and out of bed, especially in the case of a particular resident, and the improvement in the times spent brushing teeth by all beneficiaries. These songs were used as sound support to guide and structure the activities, promoting a positive and motivating environment that would facilitate the learning of new habits and reinforce existing routines.

The impact of these interventions was evaluated by monitoring the times required to complete the selected activities and comparing the results obtained with the initial records. This analysis not only identified significant improvements in the performance of the tasks but also highlighted the importance of the emotional and creative involvement of the beneficiaries in the process, underlining the therapeutic value of music therapy applied in everyday contexts.

Data analysis

Regarding the statistical analysis of the data, repeated measures of analysis of variance tests (ANOVA) were applied to assess significant differences before and after the intervention. In the case of "Brush, plan," the one-factor ANOVA focused on differences between dependent variables such as brushing time or level of autonomy.

At the same time, the two-factor ANOVA explored interactions between the aforementioned variables and the sex of the participants. Additionally, the effect size was calculated using partial square Eta, following Cohen's (1988) criteria, to determine the magnitude of the observed changes.

RESULTS

To determine if there were significant differences between the pre-and post-test measures, Wilcoxon's nonparametric test was performed for related measures (Table 1). In this case, the Pre group had lower values (Mdn = 3) than the Post group (Mdn = 4). The null hypothesis that the post-variable had a value less than or equal to the pre-variable has been tested using a unilateral t-test for paired samples. The result has not been statistically significant (p= .327), so the null hypothesis is maintained.

Table 1

Wilcoxon Results

	W	z	p	r
POST - PRE	0	-3.27	1	0.87

Table 2

Results of variance with a repeating factor of ANOVA tests

	Sum of Type III Squares	df	Medium squares	F	p	η^2_p
Treatment	4862.18	8	607.77	73.6	<.001	0.95
Error	264.27	32	8.26			

As can be seen in Table 2, an analysis of the variance of a factor with repeated ANOVA measures has shown that there was a significant difference between the variables (F = 73.6, p = <.001). Therefore, the null hypothesis that there are no differences between the dependent variables Age, Time spent brushing PRE, Brushing alone or with help PRE, Brushing tongue and gums PRE, Time spent brushing PRE, Brushing alone or with help POST, Brushing tongue and gums POST and Assuming an uncomfortable moment POST, is rejected, with younger people mainly benefiting from the music therapy programme. The effect size was calculated using the Eta partial square: η2p= 0.95. For Cohen (1988), the limits for effect size are 0.01 (small effect), 0.06 (medium effect), and 0.14 (large effect).

However, Table 3 shows the results of the two-factor analysis of variance with repeated ANOVA measures, showing that there was no significant difference between the groups of the

second-factor Sex in relation to the dependent variable, p= .502 and that there was no interaction between the two variables Sex and Age, Time spent brushing PRE, Brushing alone or with PRE help, Brushing tongue and gums PRE, Time spent brushing POST, Brushing alone or with help POST, Brushing tongue and gums POST and Assuming an uncomfortable moment POST in relation to the dependent variable, p= .387. As can be seen in Table 2, an analysis of the variance of a factor with repeated ANOVA measures has shown that there was a significant difference between the variables (F = 73.6, p = <.001). Therefore, the null hypothesis that there are no differences between the dependent variables Age, Time spent brushing PRE, Brushing alone or with help PRE, Brushing tongue and gums PRE, Time spent brushing PRE, Brushing alone or with help POST, Brushing tongue and gums POST and Assuming an uncomfortable moment POST, is rejected, with younger people mainly benefiting from the music therapy programme. The effect size was calculated using the Eta partial square: η2p= 0.95. For Cohen (1988), the limits for effect size are 0.01 (small effect), 0.06 (medium effect), and 0.14 (large effect).

Tabla 3

Two-Factor Variance Results with ANOVA Repeated Measures

	Sum of Type III Squares	df	Medium squares	F	p	η^2	η^2_p
Gender	9.26	1	9.26	0.58	.502	0	0.16
RM factor x gender	71.67	8	8.96	1.12	.387	0.01	0.27
Residuals (between subjets)	48.07	3	16.02				
Residuals (within subjets)	192.59	24	8.02				

Discussion

The quality of interpersonal relationships is critical to the well-being and quality of life of people with special needs. In this context, music therapy has emerged as an effective intervention in various areas. This study investigated the effects of songwriting on the development of routine tasks of users of sheltered housing, and the findings obtained align with the arguments presented in the article's introduction.

First, a noticeable positive emotional impact was observed among the participants. The creation and application of songs through songwriting promoted positive emotional reactions throughout the process. The participants experienced pleasant emotions not only when composing the songs but also when performing and listening to them. This finding reinforces the idea that music therapy can improve emotional well-being, as mentioned in previous studies that pointed to the generation of positive emotions, closeness and intimacy in people living together (Stedje *et al.,* 2023).

In addition, the atmosphere created during the songwriting sessions allowed participants to express themselves and relate to each other with greater sincerity and integrity. Improvement in communication, even among those with communication difficulties, is a result that coincides with the findings of Applewhite *et al.* (2022), who found that music therapy improves the interaction between parents and children, in our case with professionals, and Després *et al.* (2024), who concluded that musical interventions facilitate the social participation of young people with intellectual disabilities.

Our study also highlighted personal development and creativity. Specifically, Després *et al.* (2024) underlined the importance of fostering self-determination and creativity to increase young people's involvement in music therapy activities. In our case, the participants actively explored the instruments, which contributed significantly to the development of their creative and functional capacities. This result reinforces the idea that music therapy not only improves pre-existing skills but can also boost the personal development and creativity of people with disabilities.

In addition, research in the field of developmental disorders, such as autism, has indicated that music therapy can influence both the improvement of social skills and the ability to respond verbally (Mendelson *et al.*, 2016; LaGasse, 2014). Although our study did not find a statistically significant impact in all areas assessed, qualitative analysis revealed improvements in participants' willingness to cope with their daily routines, such as brushing their teeth. The analysis of variance (ANOVA) indicated significant differences in brushing practices before and after the intervention, suggesting that music therapy can positively influence routine and functional tasks in people with disabilities living together.

Similarly, personalizing music therapy interventions to the specific needs of the beneficiaries was crucial to their success. The users' selection of music, rhythms and instruments promoted a greater acceptance of the activity.

We also consider it of utmost importance to include individual preferences in the design of music therapy programs. This personalized approach is in line with the observations of Rickson and Warren (2018), who highlighted the importance of designing activities that promote the inclusion of young people with disabilities in various social settings.

Despite the positive results observed, it is important to recognize the study's limitations. Although valuable qualitative evidence was obtained on the benefits of songwriting in music therapy, the statistical results were not always significant. This could be due to individual variability and the complexity of measuring changes in emotional and relational aspects. Future studies should focus on more robust methodologies to capture these nuances and consider the inclusion of a larger number of participants to increase statistical validity.

However, despite these limitations, the results of this study reinforce the premise that music therapy, and in particular songwriting, can have a positive impact on the quality of life of people with special educational needs. Likewise, the ability to generate positive emotions, improve communication and promote personal development are key aspects that align our findings with the existing literature. However, it is critical to continue exploring and adapting these interventions to optimize their effectiveness and applicability in diverse, inclusive contexts.

In short, the analysis of variance of one factor with repeated measures (ANOVA) revealed significant differences between the various dependent variables related to tooth brushing. This indicates that the different measures taken before and after the music therapy program, as well as the brushing conditions (e.g., brushing alone or with assistance, tongue and gum brushing, etc.), present significant variations.

This conclusion suggests that toothbrushing practices and experiences vary considerably among the different conditions studied. Since significant differences were found between the dependent variables, the null hypothesis, which proposed that there were no differences between these variables, was rejected. This result confirms that the music therapy program significantly influences toothbrushing practices and experiences. Likewise, the effect size, calculated using partial square Eta, was very large, significantly higher than the limits for large effects. This indicates that the differences observed between the dependent variables are not significant enough but also of great magnitude. This reinforces the relevance of the differences found and their practical importance.

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SONGWRITING STRENGTHENS THE THERAPEUTIC RELATIONSHIP

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#9,4

MUSIC THERAPY AS AN EDUCATIONAL TOOL FOR THE IMPROVEMENT OF GROUP COHESION AND EMOTIONAL INTELLIGENCE

Musicoterapia como una herramienta para la mejora de la cohesión grupal y la inteligencia emocional

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ABSTRACT

Background. Music therapy has been widely studied in different contexts. However, its specific application to improve group cohesion and the development of Emotional Intelligence in primary school children has been little explored. **Methodology.** This study evaluates the impact of weekly sessions of 45 minutes for eight weeks, using active and receptive music therapy techniques on 14 students between 6 and 7 years old, with cognitive, socioeconomic and family diversity. Ad hoc tools were designed to measure their effectiveness in two areas (group cohesion and emotional intelligence): a questionnaire with a Likert scale to measure seven key aspects of behaviour and a frequency table to measure the use of the main tool, the "Emotionometer" and the identification of emotions. **Results.** Statistical analysis reveals significant differences in group cohesion before and after the sessions ($p = .001$), indicating a post-intervention increase. In addition, a positive effect on emotional intelligence was observed, with improvements in the coherence and expression of emotions. These results suggest that music therapy can be effective in improving coexistence and emotional self-management in Primary Education, being an effective tool in both aspects. In addition, it favoured skills such as sustained attention, tolerance and motor coordination. **Conclusions.** Integrating music therapy into the school curriculum can enrich the educational experience, fostering an inclusive and collaborative learning environment

Keywords: music therapy, dynamical systems, therapeutic alliance, iso-principle.

RESUMEN

Antecedentes. La musicoterapia ha sido ampliamente estudiada en diferentes contextos, pero su aplicación específica para mejorar la cohesión grupal y el desarrollo de la Inteligencia Emocional en niños de Educación Primaria ha sido poco explorada. **Metodología**. Este estudio evalúa el impacto de sesiones semanales de 45 minutos durante ocho semanas, utilizando técnicas de musicoterapia activa y receptiva en 14 alumnos de entre 6 y 7 años, con diversidad cognitiva, socioeconómica y familiar. Se diseñaron herramientas ad hoc para medir su efectividad en dos áreas (cohesión grupal e inteligencia emocional): un cuestionario con escala Likert para baremar siete aspectos clave de la conducta, y una tabla de frecuencias para medir el uso de la herramienta principal, el "Emocionómetro" y la identificación de emociones. **Resultados.** El análisis estadístico revela diferencias significativas en la cohesión grupal antes y después de las sesiones ($p = .001$), indicando un aumento postintervención. Además, se observó un efecto positivo en la inteligencia emocional, con mejoras en la coherencia y expresión de las emociones. Estos resultados sugieren que la musicoterapia puede ser efectiva para mejorar la convivencia y autogestión emocional en Ed. Primaria, siendo una herramienta efectiva en ambos aspectos. Además, favoreció habilidades como la atención sostenida, la tolerancia y la coordinación motriz. **Conclusiones.** Integrar la musicoterapia en el currículo escolar puede enriquecer la experiencia educativa, fomentando un ambiente de aprendizaje inclusivo y colaborativo.

Palabras clave: musicoterapia, inteligencia emocional, cohesión grupal, educación primaria, necesidades educativas.

INTRODUCTION

Although the use of music therapy has been widely studied (Fernández-Company *et al.,* 2024; Freitas *et al.,* 2022; Nevado-Minaya & Fernández-Company, 2022; Sotelo-Martín *et al.,* 2021), the application of this discipline as a tool to facilitate group cohesion and the development of Emotional Intelligence (EI) in Primary Education (PE) students has been scarcely explored. This gap in the literature is particularly relevant given the growing interest in the development of socio-emotional competencies at early ages, especially in disadvantaged socioeconomic contexts, where students' emotional and social needs may be more pressing (Guhn et al., 2020).

From this perspective, the relationship between music and the development of emotional intelligence has been widely studied in the educational field. Music is not only a means of artistic expression but also a powerful tool to strengthen emotional and social development in children and young people (García-Rodríguez *et al.,* 2023; Peretz, 2019; Requena *et al.,* 2021; Rickard *et al.,* 2013). Recent studies have shown that music can modulate emotional responses and improve children's ability to identify and regulate their emotions (Zentner & Eerola, 2010). In addition, music has been associated with improved attention, memory, and problem-solving skills, skills that are critical for academic and social success (Miendlarzewska & Trost, 2014).

Different studies have shown that music education can significantly contribute to emotional well-being, social cohesion and the acquisition of socio-emotional skills essential for interaction and learning (García-Rodríguez *et al.,* 2020; Miendlarzewska & Trost, 2014; Valero-Esteban *et al.,* 2024; Váradi, 2022). For example, a longitudinal study by Creech et al. (2013) found that children who participated in music education programs showed significant improvements in their ability to work in teams and resolve conflicts, skills that are crucial for group cohesion.

In this sense, Kaschub (2002) highlights that one of the main objectives of music education is to help students understand the connection between music and emotions, emphasizing the importance of socio-emotional intelligence in participation in music programs. Wang *et al.* (2022) expand on this perspective by analyzing the impact of music education on the mental health of higher education students, noting that emotional intelligence acts as a key moderator in this process. These findings suggest that music not only has a direct impact on emotional well-being but can also act as a catalyst for the development of broader social-emotional skills (Saarikallio *et al.,* 2020).

From a child development perspective, Blasco-Magraner *et al.* (2021) conducted a systematic review suggesting that the educational use of music can contribute to the development of emotional intelligence in children, influencing the perception, evaluation, and regulation of emotions. In line with this idea, Pastor-Arnau *et al.* (2018) present a music-based emotional education program in primary education, the results of which show improvements in students' self-perception and various emotional variables. These programs not only encourage emotional expression but also promote empathy and understanding of others' emotions, key aspects for group cohesion (Rabinowitch *et al.,* 2013).

Regarding the social benefits of music, Hallam (2010) highlights that participation in group musical activities improves social cohesion and the development of emotional skills, as well as enhancing intellectual development. Similarly, Rabinowitch *et al.* (2013) found that these activities favour the students' ability to connect emotionally with their peers. Ansdell (2014) argues that music acts as a "shared space" that promotes interaction and a sense of community, while Boer and Abubakar (2014) point out that music strengthens social cohesion and emotional well-being in young people, both in the family environment and in peer groups. These findings are particularly relevant in educational contexts, where group cohesion can be a determining factor for students' academic and social success (Kirschner & Tomasello, 2010).

From a neuroscientific perspective, Juslin and Sloboda (2010) suggest that music can be used to develop emotional skills since the ability to recognize emotions in music is related to emotional intelligence. Resnicow *et al.* (2010) suggest that music can be an effective tool to improve this skill. Thoma *et al.* (2013) highlight its role in reducing stress and improving emotional well-being, which facilitates the development of emotional intelligence. Recent studies have noted that music activates brain areas associated with emotional processing, such as the amygdala and prefrontal cortex, suggesting that musical experience can have a profound impact on emotional development (Koelsch, 2014). Likewise, in terms of neurological bases, Koelsch (2014) points out that music activates brain areas related to emotional processing, reinforcing the idea that musical experience can have a profound impact on emotional intelligence.

From music therapy, Kirschner and Tomasello (2010) emphasize that participation in group musical activities encourages prosocial behaviours in young children, which contributes to group cohesion and the creation of strong social bonds. Weinstein *et al.* (2016) add that group singing not only reinforces social cohesion but also lowers the threshold of pain, suggesting that music plays a key role in strengthening group bonds. These findings are consistent with evidence suggesting that music can modulate the activity of

neuroendocrine systems, reducing cortisol levels and promoting the release of oxytocin, a hormone associated with social bonding and trust (Chanda & Levitin, 2013).

Finally, Dumont *et al.* (2017) review the effects of musical interventions on child development and conclude that, although the results suggest potential benefits, more research is required to fully understand the factors that influence the outcomes of such interventions. In short, these studies underscore the importance of using music as a valuable educational tool to strengthen emotional intelligence, foster social cohesion, and promote the well-being of students at different educational levels.

Based on these premises, the aim of this study was to explore the impact of music therapy as a tool to facilitate group cohesion and the development of emotional intelligence (EI) in Primary Education (PE) students, particularly in a disadvantaged socioeconomic context. We sought to evaluate how interventions based on active and receptive music therapy techniques can influence emotional identification, expression and regulation, as well as social cohesion among students.

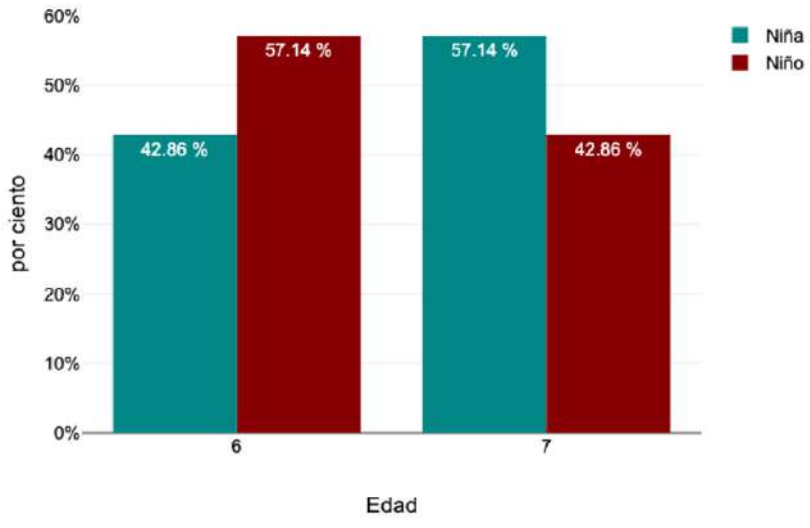
MATERIALS AND METHOD

Participants

The sample we have worked with in this study consists of 14 primary education students aged between 6 and 7 (M=6.5; SD= 0.52), of whom 50% were girls. Figure 1 provides a detailed description.

Figure 1

Distribution of the sample by variables



The sample was composed of middle—and lower-class families, one of which was at risk of extreme poverty. This study was conducted to explore how diverse family, socioeconomic, and educational conditions influence children's school performance and well-being.

In terms of academic representation, it was observed that most families had at least a university or intermediate degree, suggesting a significant level of formal education. However, family stability showed great variability, with cases of separation and situations of gender violence affecting the domestic environment. The school performance of the children was diverse, and although there was an inclination towards good academic achievement, cases of learning difficulties and attention problems were also found. These findings underscore the need for targeted educational support to address these difficulties and ensure effective learning.

The children's social skills also varied widely. While some showed good social skills, others were dependent or insecure in their interactions. This diversity in social skills reflects the different dynamics and supports present in their family environments.

Motivation and interest in the school environment were generally high, although not exempt from cases of unstable or low motivation. Specific health problems, such as ADHD and physical disabilities, were also present, significantly affecting the learning and behavioural capacities of some children.

In summary, this study reveals a complex network of family, socioeconomic and educational factors that influence school performance and children's emotional and social well-being. These findings underscore the importance of addressing these diverse conditions to promote comprehensive and equitable education development.

Incentives and measures

Stimuli. 8 sessions (one per week) of 45 minutes have been carried out, using both active and receptive music therapy techniques (Fernández-Company, 2024). In the intervention sessions, various musical and visual stimuli were used to facilitate identification, expression and emotional regulation in the participants.

Auditions of musical pieces selected according to their relationship to specific emotions (joy, sadness, fear, anger and calm) were used, including fragments of soundtracks and popular songs. In addition, dynamics of singing, body percussion and instrumentation were integrated with small percussion instruments (maracas, bells, tambourines, claves

and triangles), promoting sound experimentation and creative expression.

On a visual level, the "Emotionometer" was implemented, a panel with images of facial expressions corresponding to basic emotions, which the children used at the beginning and end of each session to record their mood. Illustrations from the story

El Mon-strum de Colores (Llenas, 2012) were also used to reinforce the association between emotions and their graphic representation and other musical stories. These stimuli were combined in structured activities and musical games designed to enhance empathy, cooperation and emotional exploitation in a playful and safe environment.

Measurement. Two ad hoc tools were designed to evaluate the music therapy sessions. The first, a questionnaire based on a five-point Likert scale, measured the effectiveness of music therapy as an instrument of group cohesion through seven key aspects related to participation, interaction and emotional regulation.

The scale included items on active participation, maintenance of attention, following instructions, harmonious movements, respect for group interaction and assertive expression.

The second tool consisted of a frequency table to assess the development of emotional intelligence. Three specific indicators were analyzed: the use of the Emotionometer at the beginning of the session and its coherence with the participant's emotional state, as well as the ability to recognize and name basic emotions in the context of musical dynamics.

The data were recorded over eight sessions, allowing a quantitative analysis of individual and group progress in terms of emotional intelligence.

Procedure

The study was carried out systematically, ensuring the active participation of all parties involved. First, the educational centre's management team was interviewed, and the objectives and characteristics of the proposal were presented.

After obtaining their approval, the faculty, the specialist in Music Education, and a student of Teacher Training were informed to coordinate and request their collaboration in implementing the project.

Afterwards, an informative meeting was held with the participants' families to ensure transparency of the process and obtain their informed consent. During this session, the conditions under which the project would be developed were explained, fostering a mutual understanding of the objectives and approach of the intervention. The necessary material was then collected and prepared to carry out the sessions that were integrated into the school schedule.

In this way, this space was used to carry out the intervention with a group of 14 students without interfering with other curricular activities. For data collection, it was decided to record the sessions, the content of which was reviewed and recorded in an observation diary, with the aim of monitoring progress in detail.

In addition, due to the young age of the participants, the Likert scale used in the project was completed by the music therapist, who evaluated the key indicators from the direct observation category.

Data analysis

Regarding the analysis of the data obtained, statistical tools were used that allowed the results to be evaluated rigorously. The repeated measures *ANOVA* test helped to identify significant differences in dependent variables, such as use, coherence, emotional identification and expression, throughout the different phases of the intervention.

In addition, the *Wilcoxon* test was used to compare changes in pre- and post-treatment variables, which was an appropriate option given the nonparametric nature of the paired data. Finally, a reliability analysis was carried out to evaluate the internal consistency of the questionnaire used, identifying the correlation between the items and selecting those that offered greater precision and coherence at the scale applied.

RESULTS

First, with respect to the analysis of the use, coherence identification and emotional expression of the Emotionometer, Tables 1 and 2 detail the results of the analysis of variance of a factor with repeated measures that have shown that there was a significant difference between the variables ($F = 7.15$, $p = <.001$) with an effect size $\eta 2p = 0.35$.

According to Cohen (1988), the limits for effect size are 0.01 (small effect), 0.06 (medium effect), and 0.14 (large effect). This suggests that the treatment had a considerable effect on the measured variables, indicating that the treatment can explain a significant proportion of the variance in the dependent variables. Table X also shows the statistical results of the Wilcoxon test for the three factors of the questionnaire.

Table 1

ANOVA statistical results with repeated measures

	Sum of Type III Squares	df	Medium squares	F	p	η^2_p
Treatment	3.49	5	0.7	7.15	<.001	0.35
Error	6.35	65	0.1			

Table 2

Statisticians Wilcoxon Test

	W	z	p	r
Post Use. - Pre Use.	0	-2.45	14	0.65
Post Coherence - Pre Coherence	0	-2.45	14	0.65
Ideate. and expo. Emo. Post - Ideen. and expo. Emo. Pre	0	-2.24	25	0.6

Table 3

Statistical results of the Wilcoxon test

	W	z	p	r
Group cohesion POST - PRE	0	-3.27	I	0.87

Figure 2

Box Plot of Pre-Post Group Cohesion Outcomes

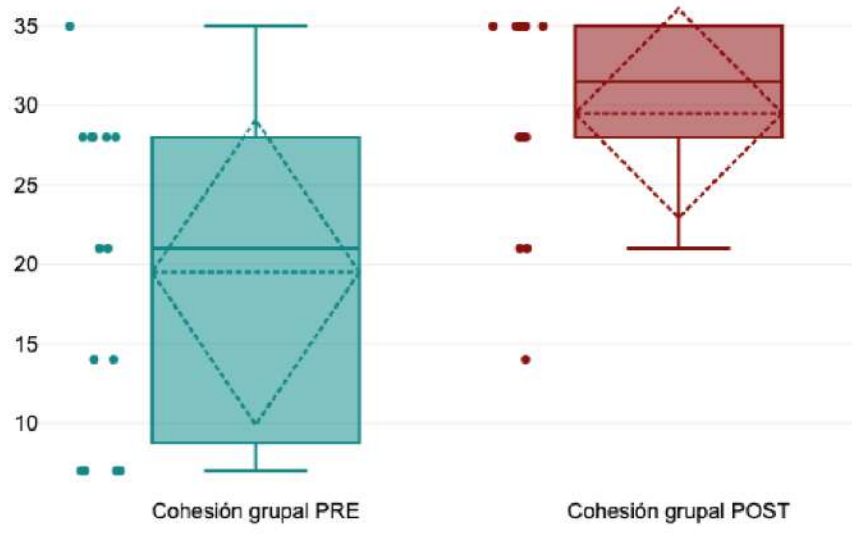


Tabla 4

Results of the intraclass correlation coefficient

Intra class correlation coefficient	Lower 95%-CI	Upper 95%-CI	F	df1	df2	p
0.01	0	0.03	3.17	13	78	**.001**

Next, in Table 3 and Figure 2, it can be seen that the Group Cohesion group PRE had lower values (M = 19.5) than the Group Cohesion group POST (M = 29.5). In this sense, the null hypothesis that the variable Group Cohesion POST had a value less than or equal to the variable Group Cohesion PRE has been tested using a unilateral t-test for paired samples. The result was statistically significant, p = .001, so this null hypothesis was rejected.

Finally, Table 4 shows the statistical results of the reliability analysis between the items of a questionnaire, showing an acceptable Cronbach's alpha (α= > 0.7).

DISCUSSION

The results of this study confirm that music therapy has a significant impact on the development of emotional intelligence and group cohesion in primary school students. These findings are in line with previous literature highlighting the role of music as a powerful tool for emotional and social development in children (Peretz, 2019; Requena *et al.*, 2021; Rickard *et al.*, 2013).

In particular, the use of the "Emotionometer" and structured musical dynamics allowed participants to identify and express basic emotions more effectively, reinforcing the idea that music can be a vehicle for emotional exploration and affective regulation (Blasco-Magraner *et al.*, 2021; Pastor-Arnau *et al.,* 2018).

The observed improvement in group cohesion also supports previous research findings highlighting the role of group musical activities in promoting social interaction and a sense of community (Ansdell, 2014; Rabinowitch *et al.*, 2013).

Engaging in singing and body percussion dynamics not only fostered cooperation but also reduced emotional barriers among students, suggesting that music can act as a "shared space" that facilitates emotional connection (Kirschner & Tomasello, 2010; Wein-stein *et al.,* 2016).

From a neuroscientific perspective, the results are also aligned with evidence suggesting that music activates brain areas related to emotional processing (Koelsch, 2014).

Participants' ability to recognize and name emotions in the context of musical dynamics may be related to the activation of these areas, reinforcing the idea that musical experience has a profound impact on the development of emotional intelligence (Juslin & Sloboda, 2010; Resnicow *et al.,* 2010).

Despite the promising results, this study has several limitations. First, the sample was relatively small (n = 14) and homogeneous in terms of age and socioeconomic background, limiting the generalizability of the findings.

In addition, the short duration of the intervention (8 sessions) may not have been enough to observe more profound changes in the participants' emotional and social development. Another limitation was the reliance on direct observation and evaluation by the music therapist, which could introduce bias in the interpretation of the results.

From this perspective, we believe that future research should consider expanding the sample and including control groups to compare the effects of music therapy with other educational interventions. It would also be valuable to explore the long-term impact of these interventions and their applicability in different socioeconomic and cultural contexts.

In addition, more objective measures, such as physiological recordings or neuroimaging, could be incorporated to complement subjective assessments and gain a more complete understanding of the underlying mechanisms.

The results of this study also have important implications for the educational field. First, they suggest that music therapy can be an effective tool to promote emotional and social development in primary school students, particularly in disadvantaged contexts. Integrating music therapy programs into the school curriculum could help address students' emotional and social needs, improving their well-being and academic performance.

In addition, the results support the idea that music education should not be limited to teaching technical skills but should also focus on developing socio-emotional competencies. Teachers and music education specialists could benefit from incorporating music therapy techniques into their pedagogical practices, using music to foster empathy, cooperation, and emotional regulation in the classroom.

In conclusion, this study contributes to the growing evidence supporting the use of music as a valuable educational tool for students' holistic development. Although more research is needed to understand its effects fully, the results suggest that music therapy may play a key role in promoting emotional intelligence and group cohesion in the educational setting.

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THE EMOTIONAL COMPONENT OF MUSIC IS A GOOD EDUCATIONAL TOOL

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MUSIC THERAPY FOR STRESS REDUCTION IN HEALTHY ADULTS: A SYSTEMATIC REVIEW

Musicoterapia para la reducción del estrés en adultos sanos: una revisión sistemática

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ABSTRACT

Background. Stress is a prevalent problem today, and music therapy is presented as a discipline with great potential to reduce stress-related symptoms. However, systematic reviews of the efficacy of music therapy in this context are controversial. **Objective**. This paper aims to conduct a systematic review of the literature to assess the efficacy of music therapy in reducing stress in healthy adults. **Method**. A strategic search was conducted by consulting scientific databases and 12 studies were selected from a total of 3690 identified sources, involving 807 participants aged 18-44 years. **Results**. The reviewed studies indicated that music therapy can reduce stress by positively influencing blood pressure, heart rate, cortisol levels and emotional well-being. However, these effects are not uniform and depend on factors such as musical preference, social context, and frequency of music listening. **Conclusions**. Music therapy is a promising intervention for stress reduction, but its effectiveness depends on personalised approaches and further research in ecological contexts. Its integration with other therapeutic strategies could improve physical and psychological health in diverse populations.

Keywords: music therapy, stress reduction, healthy adults, music listening, well-being.

RESUMEN

Antecedentes. El estrés es un problema prevalente actualmente, y la musicoterapia se presenta como una disciplina con gran potencial para reducir sus síntomas. Sin embargo, las revisiones sistemáticas sobre su eficacia en este contexto son controvertidas. **Objetivo.** Este artículo tiene como objetivo elaborar una revisión sistemática de la literatura para evaluar la eficacia de la musicoterapia en la reducción del estrés en adultos sanos. **Método.** Se realizó una búsqueda estratégica consultando bases de datos científicas y se seleccionaron 12 estudios de un total de 3690 fuentes identificadas, involucrando a 807 participantes entre 18 y 44 años. **Resultados.** Los estudios revisados señalaron que la musicoterapia puede reducir el estrés al influir positivamente en la presión arterial, la frecuencia cardíaca, los niveles de cortisol y el bienestar emocional. Sin embargo, estos efectos no son uniformes y dependen de factores como la preferencia musical, el contexto social y la frecuencia de escucha musical. **Conclusiones.** La musicoterapia es una intervención prometedora para la reducción del estrés, pero su eficacia depende de enfoques personalizados y de una mayor investigación en contextos ecológicos. Su integración con otras estrategias terapéuticas podría mejorar la salud física y psicológica en diversas poblaciones.

Palabras clave: musicoterapia, reducción del estrés, adultos sanos, escucha musical, bienestar.

INTRODUCTION

Although the positive influence of music and music therapy on people's well-being has been widely explored (Fernández-Company *et al*., 2022; García-Rodríguez *et al*., 2023) and,

specifically, in stress reduction (Adiasto *et al.,* 2022; de Witte *et al.*, 2020), systematic reviews on this topic are less frequent.

Stress

The World Health Organization (WHO) defines stress as a state of worry or mental tension caused by challenging circumstances (WHO, 2023). Physiologically, stress activates the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system, leading to the release of cortisol and catecholamines. In this sense, prolonged exposure to stress can have adverse effects on mental and physical health, increasing the risk of cardiovascular diseases, cognitive impairment and psychiatric disorders, which impact quality of life (Chida & Steptoe, 2010).

Given the increasing prevalence of stress in contemporary society, characterized by immediacy and constant pressure, it is essential to identify and understand effective tactics for managing it. Exercise, meditation, and music are among the most accessible and noninvasive behavioural strategies (Matney, 2017).

Music therapy

Music has accompanied humanity since prehistoric times, playing an essential role in expression, communication, and emotional well-being (Yehuda, 2011). Its impact on daily life is widely recognized, both individually and collectively, and it maintains its relevance today through digital formats and live events (Ministry of Culture and Sport, 2019).

Numerous studies have explored the relationship between music and psychology, highlighting their influence on attention, emotional valence, and mood modulation (Koelsch, 2020). Moreover, music therapy, defined as the professional use of music for therapeutic purposes in medical, educational and social settings (World Federation of Music Therapy, 2011), has been proposed as an effective intervention to reduce and regulate the negative physiological and psychological effects associated with stress, promoting relaxation and well-being through specific techniques (de Witte *et al.*, 2020). Its accessible, noninvasive, and low-cost nature makes it a viable non-pharmacological option in both clinical and everyday settings (Gooding *et al.,* 2012). In this way, listening to music is not only an act of entertainment but also a receptive music therapy intervention; it represents an effective tool to improve mood and develop coping strategies in the face of stress and anxiety (Lynar *et al.,* 2017).

Despite the documented benefits, the evidence on the impact of music on stress reduction remains inconsistent, with discrepancies persisting about its effectiveness, modulating factors, and applicability (Adiasto *et al.,* 2022). Consequently, this article aims to provide a systematic review of the recent literature on the impact of music therapy on stress reduction in healthy adults, analyzing its potential as a therapeutic tool for emotional well-being.

MATERIALS AND METHOD

Search strategy

A search strategy was implemented using the key terms (**Music Therapy*) AND (**Stress Reduction*) AND (**Healthy Adults*) in English, covering several international electronic databases: *Google Scholar, SciELO, PubMed, Web of Science, ERIC, Springer Journals, Wiley Online Library, Scopus and ProQuest Central* (*APA PsycINFO, ProQuest Health and ProQuest Psychology*); as well as specific artificial intelligence tools: SciSpace. In addition, we hand-searched the bibliographic references of the selected articles to identify additional relevant studies. A total of 3690 articles were identified.

Inclusion and exclusion criteria

Studies considered for inclusion in this systematic review had to meet the following criteria:

- Published between January 2014 and March 2024 and available in English and/or Spanish.
- Published in peer-reviewed, high-impact factor-indexed journals.
- Include research with fieldwork.
- Music therapy should be one of the main components of the study.
- The study group should consist exclusively of healthy adults.

As for the exclusion criteria, the following have not been considered:

- Previous reviews, opinion or conceptual articles.
- Articles that did not have the full text available.
- Studies that looked at the use of music therapy to relieve stress in adults affected by a specific disease or in other demographics.

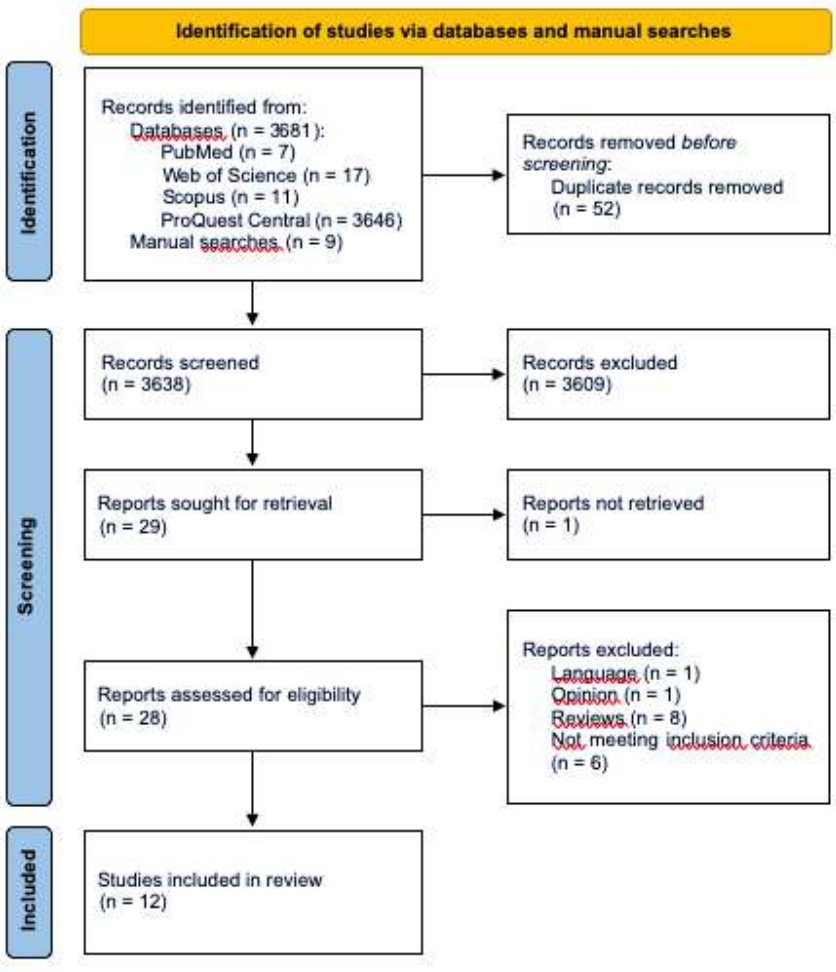
Selection procedure

First, several preliminary explorations were carried out in multiple databases, involving an analysis of relevant words using different Boolean search equations. Subsequently, a conclusive search was carried out using the final selection of key terms.

Studies that met the inclusion criteria were then selected. To do this, duplicates were removed, titles and abstracts were examined to assess their relevance, and the full text of those that appeared eligible was evaluated. In addition, we performed an additional hand search on them.

This procedure was carried out following the guidelines established in the *PRISMA* statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Page *et al.*, 2021). Figure 1 illustrates the search strategy and selection process for the sources included in this review.

Figure 1.
PRISMA flowchart.



Source: adapted from Page *et al.* (2021).

Data extraction and management

The search results were exported to Mendeley Reference Manager version 2.112.0 to manage all references.

Relevant information from the articles was collected using standardized forms presented in table format, including the following fields: authors, year of publication, country of origin, objective and design of the study, characteristics of the sample (size, context, etc.), techniques used, number and duration of sessions, instruments and evaluation measures used, and results obtained.

Study selection results

After removing duplicates and non-relevant studies, 29 studies were initially eligible for inclusion. However, during the selection process, 17 studies were excluded because they did not meet the inclusion criteria. Finally, this review included 12 studies published between January 2014 and March 2024 in various countries and in leading scientific journals specializing in medicine, psychology or music therapy. Table 1 provides a detailed summary of the studies that met the inclusion criteria in chronological order.

RESULTS

Participants

The total number of participants in the studies reviewed was 807, including university students and young adults with no notable health problems aged between 18 and 44. Notably, three studies included samples from amateur musicians.

Interventions

The interventions were based on listening to music, and different approaches were used. Six studies used relaxing music, while three used stimulating music. In addition, three evaluated the impact of different musical genres, and four examined the impact of participants' musical preferences.

Experimental conditions varied between studies. In seven, music listening was compared with other activities, such as silence, audiobooks, musical improvisation, or other regulatory strategies. Two explored the influence of context, assessing differences between solo and company listening or listening environments, and one examined the effect of musical frequency. In terms of session duration, eight studies conducted single sessions of between 20 and 105 minutes, structured in different phases (initial assessment, stress induction and recovery). Instead, four longitudinal studies looked at the impact of music over periods of 5 to 7 consecutive days.

Methodological aspects of the intervention

With respect to assessment environments, six studies were conducted in laboratories, leading to greater experimental control. Three used outpatient evaluations, facilitating observation in natural environments, while four were performed in private homes or other environments.

Five studies used different randomized controlled trials in terms of design.

Table 1.
Study characteristics.

Citation / Country / Design	Objective	Sample / Age / Context	Intervention / Number of sessions and duration	Measuring instruments	Results
Radstaak *et al.* (2014) / Netherlands / Intersubject RCT (quantitative)	To assess the effects of different recovery conditions after mental stress	123 HS / $\bar{X}$ = 21.1 ± 4.1 / Laboratory	Listen to favorite relaxing and upbeat music (EG); audiobook and silence (CG) / 1 session (4 phases, 20 min)	Questionnaires; Physiological Measures	BP (↑), NA (↓), mood (↑); delayed recovery from SBP, difference disappears in subsequent silence
Linnemann *et al.* (2015) / Germany / Intrasubject OA (quantitative)	Examine Effect of Music Listening on Stress Reduction in Daily Life	55 HS / $\bar{X}$ = 23.20 ± 3.11 / Outpatient evaluation	Listen to everyday music (different purposes) / 6 periods for 5 consecutive days (beginning-end of semester)	Physiological and subjective stress indicators (Likert scale); MPQ	Subjective stress (↓), sCort (↓) (purpose: relaxation); sAA depends on *arousal*: relaxing (↓), energizing (↑) music
de la Torre-Luque *et al.* (2016) / Spain / RCT double-blind (quantitative + qualitative elements)	To evaluate the impact of relaxing music on cardiovascular recovery and stress	24 HS/ $\bar{X}$ =23.05±2.97/Lab	Listen to relaxing Melomics (EG) music; silence (CG) / 1 session (4 stages)	Questionnaires; BSI; GSI; MSQ; PASAT; STAI-T; TSQ; TSST	EG Better Emotional Regulation and Greater Data Variability vs. CG: Musical Intervention May (↓) Stress
Jiang *et al.* (2016) / China / Experimental in eight groups (quantitative)	Analyze the role of music preference in stress reduction	200 HS / $\bar{X}$ = 20.29 ± 1.395 / Quiet classroom	Varied music listening (high/low *arousal*, valence, familiarity) / 1 session, 25 min (3 stages)	Likert scale; STAI	Medium musical preference effects of *arousal* and valence on stress reduction; preference > *arousal* > valence
Linnemann *et al.* (2016) / Germany / AA (quantitative)	To evaluate the stress-reducing effect of listening to music in different social contexts	53 HA / $\bar{X}$ = 23.32 ± 3.08 / Outpatient evaluation	Listen to everyday music (different purposes) / 6 periods for 7 consecutive days	Physiological and subjective stress indicators; self-reports; Likert scale; PHQ; Conduct records; GOING	Solitary hearing (↓) subjective stress (purpose: relaxation); in company it enhances effects, sCort (↓), sAA (↑)
Nakajima *et al.* (2016) / Japan / Experimental (quantitative)	Examine effects of high/low frequency amplified music in stress recovery	12 HS (AM) / 21-22 years old / Room with 24° C	Musical Audition (Mozart) in original format, HFM and LFM; white noise; Stressful noise / 1 session (7 phases)	Self-report; DS; physiological measurements; MemCalc	HFM is more effective for stress reduction and BP

Table 1.
Study characteristics (cont.)

Citation / Country / Design	Objective	Sample / Age / Context	Intervention / Number of sessions and duration	Measuring instruments	Results
Linnemann *et al.* (2017) / Germany / AA in two centres (quantitative)	Examine temporal dynamics between stress and music listening in daily life	60 HS/ $\bar{X}$ = 22.4 ± 3.5 / Outpatient Evaluation	Listen to everyday music / 6 signals in 12 h for 6-7 days	Self-reports; questionnaire; Electronic Journal	Listening ≥20 min (↓) subjective stress; effects not corroborated by objective data (limitations)
de la Torre-Luque *et al.* (2017) / Spain / RCT double-blind (quantitative)	Examine effects of preferred relaxing music on stress recovery by music genre	58 HS/ $\bar{X}$ =21.74±3.26/ Laboratory	Listening to Preferred Relaxing Music (EG); silence (CG) / 1 session (3 stages)	BFNE-S; BSI; questionnaires; interviews; physiological measurements; PANAS; SSS; STAI; ST-DEP; S-STOMP; FIREBRAND; TSST	GD higher RH power and data variability vs. CG; anxiety (↓), depression (↓), NA (↓) and BP (↑); positive differences according to gender and preference
Baltazar *et al.* (2019) / Sweden / Experimental intrasubjects (quantitative)	Evaluate stress reduction through interaction of regulation strategies and individual music	34 AM / $\bar{X}$ = 23.71 ± 4.91 / Lab	Music listening and selected "proper" or "inappropriate" regulation strategies / 2 repeated blocks (4 sequences)	Survey; self-reports; physiological measurements; GOING	BP (↓), SCL (↓), startle blinking (↑), energy (↓), valence (↑), risk-taking (↑) in the face of music and "appropriate" strategies
Malakoutikhah *et al.* (2020) / Iran / RCT with crossover design (quantitative)	Evaluate the impact of different musical genres on relaxation and anxiety	46 HS / $\bar{X}$ = 20.22 ± 1.03 / University education	Musical audition: *pop* (Kenny G), *rock* (Metallica), Western classical (Mozart), traditional Persian (Motebassem); and silence / 5 sessions, 1 h/day consecutive	SRSI (SRSI3); STAI	All musical genres and silence, except *rock*, (↓) anxiety and (↑) relaxation alike; Favorite *Persian Pop* and Traditional Music
Fallon *et al.* (2020) / USA / RCT in three groups (quantitative)	Compare music listening effects vs. Improvisation in stress reduction	105 HS/ $\bar{X}$ =20.58±1.86/Lab	Listening (*Sleep*, Whitacre) (ML); xylophone improvisation (E); silence (CG) / 1 session (3 stages)	Self-reports; BDI; questionnaires; physiological measurements; TSST	ML: EDA (↓), MI: only satisfaction (↑); ML stress (↓) vs. MI and CG

Table 1.
Study characteristics (cont.).

Citation / Country / Design	Objective	Sample / Age / Context	Intervention / Number of sessions and duration	Measuring instruments	Results
Tervaniemi *et al.* (2021) / Finland / Exploratory (quantitative + qualitative elements)	Compare emotional and physiological responses to music listening in different settings	37 HA (AM) / $\bar{X}$ = 26.4 ± 4.4 / Home and laboratory	Listen to neutral and preferred music / 1 session (2 phases, 10 min, 2-7 days) at home; 1 session (105 min) in the laboratory	Self-reports; questionnaires; interviews; Physiological Measures	Onset: physiological and psychological differences; after intervention: casa *arousal* (↑), PV (↑) and NV (↓); both (↓) sCort equally after intervention (context conditions the auditory experience)

Source: ↑: magnification; ↓: decrease; =: no change; AA: outpatient evaluation; AM: amateur musicians; BDI; Beck Depression Inventory; BFNE-S: Brief Fear of Negative Evaluation Scale; BP: blood pressure; BSI: Brief Symptom Inventory; CG: control group; SD: semantic differential; ECG: electrocardiogram; EDA: electrodermal activity; EG: experimental group; GSI: Global Severity Index; HFM: amplified music with a high-frequency component; HR: heart rate; HRV: heart rate variability; HS: healthy students; LFM: amplified music with a low-frequency component; MI: musical improvisation group; ML: musical listening group; MPQ: Music Preference Questionnaire; MSQ: Musical Styles Questionnaire; NA: negative affect; NV: negative valence; AP: positive affect; PV: positive valence; PANAS: Positive and Negative Affect Schedule; PASAT: Paced Auditory Serial Addition Test; PHQ: Patient Health Questionnaire; RCT: randomized controlled trial; sAA: salivary alpha-amylase; SBP: systolic blood pressure; SCL: skin conductance levels; sCort: salivary cortisol; SRSI; Smith Relaxation States Inventory, SSS: Sensation-Seeking-Scale; ST: skin temperature; STAI(-T): State-Trait Anxiety Inventory (-Trait); ST-DEP: State-Trait Depression Questionnaire; STOMP: Short Test Of Music Preferences; ASD: personality test; TSQ: Trial Status Questionnaire; TSST: Trier Social Stress Test; VAS: Visual Analogue Scale.

Three applied intra-subject outpatient evaluations, and the remaining four were developed under an experimental design.

Psychological and physiological instruments were used to measure the effects of music on stress and well-being. All studies included standardized questionnaires, quantitatively recording participants' perceptions. Nine studies assessed physiological responses, measuring heart rate, salivary cortisol levels, blood pressure, and skin conductance, among other indicators.

Statistically, the studies used various techniques to analyze significant differences between groups or evaluate multiple variables simultaneously. In addition, post hoc tests were used to determine relationships between variables and correct for statistical error in studies with multiple comparisons.

Results

All studies suggest a significant decrease in perceived stress and an improvement in emotional well-being after the musical intervention. Six studies (de la Torre-Luque *et al.,* 2016, 2017; Linnemann *et al.,* 2015, 2016; Radstaak *et al.,* 2014; Tervaniemi *et al.,* 2021) reported that relaxing music was effective for these purposes. Particularly, in three (Baltazar *et al.*, 2019; de la Torre-Luque *et al.,* 2017; Jiang *et al.,* 2016), the music selected by the participants was shown to be more effective in inducing states of relaxation and reducing stress compared to the music not chosen by them. On the other hand, two (de la Torre *et al.*, 2017; Malakoutikhah *et al.,* 2020) alluded to differences with respect to genre, finding that rock had a less relaxing effect than others. The study by Nakajima *et al.* (2016) found that high-frequency amplified music was more effective than low-frequency music.

In addition, the findings of three studies (Linnemann *et al.*, 2016, 2017; Tervaniemi *et al.,* 2021) indicated that factors such as the social context, the listening environment, or the duration of the intervention influence its effectiveness. Finally, two (Fallon *et al.,* 2020; Radstaak *et al.*, 2014) reported that listening to music led to a greater reduction in stress compared to other interventions, such as audiobooks or musical improvisation. However, the latter showed differential effects on satisfaction levels, while Baltazar *et al.* (2019) observed that the combination of regulation strategies with participant-appropriate musical interventions was effective for these purposes.

Limitations in the studies reviewed

The studies reviewed have methodological limitations recognized by their authors, which restrict the generalization of the findings.

These include the use of small and homogeneous samples, which makes it difficult to extrapolate the results to clinical populations or high-stress contexts; partial physiological measurements due to the lack of key biomarkers such as oxytocin or immune system indicators; and the poor control of individual and contextual variables in some of them, such as previous musical experience and social interaction.

Likewise, ecological validity is compromised in experimental studies, and in those at home, biases could have been introduced due to the lack of supervision in compliance with the protocols.

In addition, late measurements could have influenced the detection of immediate physiological and subjective changes. Finally, most studies do not compare musical interventions with other coping strategies, which limits their evaluation in relation to alternative interventions.

Recommendations for future research

To address these limitations, it would be recommended to broaden the diversity of samples and contexts, incorporating different sociodemographic characteristics, socioeconomic levels, and degrees of stress exposure, and to consider integrating additional biomarkers for a complete assessment of subjective emotional response and music-induced physiological changes. Likewise, it would be essential that the experimental design rigorously controls individual and contextual variables, incorporating factors such as musical experience and preference and the quality of the social environment.

Methodologies that allow the impact of music to be assessed under natural conditions could optimize ecological validity. Finally, it would be necessary to compare music with other stress-coping strategies and explore the role of oxytocin in social contexts to understand its psychobiological mechanisms more deeply.

DISCUSSION

Critical Review of Recent Developments

In relation to Radstaak et al. (2014), Cao and Zhang (2023) endorsed the efficacy of music therapy in reducing blood pressure, heart rate, and anxiety, especially in hypertensive patients. However, Adiasto *et al.* (2022) warned that these effects can vary depending on factors such as music genre, tempo, and who selects the music.

Linnemann *et al.* (2015) and de Witte *et al.* (2020) found that relaxing music decreases stress and cortisol levels, while Song *et al.* (2023) did not observe significant differences in some measures of stress. However, they identified variations according to sex. For their part, de la Torre-Luque *et al.* (2016) and Krause *et al.* (2021) found improvements in emotional and physiological well-being with relaxing music, while Gupta and Gupta (2015) found no significant effects in healthy people.

Jiang *et al.* (2016) determined that personal music preference is more determinant in stress reduction than arousal levels or music valence. Jiang *et al.* (2013) showed that sedative music only reduced anxiety if it was to the listener's taste. Parada-Cabaleiro *et al.* (2022) indicated that classical music increases the feeling of subjective calm without affecting heart rate, concluding that familiarity with music is not a crucial factor.

Linnemann *et al.* (2016) showed that listening to music in a company enhances its positive effects, reducing subjective stress and cortisol secretion. Similarly, Liljeström *et al.* (2012) found that the music chosen by the listener, the social context and the openness to the experience increase the perceived emotional intensity. Wuttke-Linnemann *et al.* (2019) observed differences according to sex and dyadic covariation in physiological responses. For their part, Koelsch *et al.* (2016) highlighted the causal role of mood in modulating stress responses.

In another instance, Nakajima *et al.* (2016) and Akimoto *et al.* (2019) indicated that high-frequency music is more effective for stress recovery. Lynar *et al.* (2017) found that music selected by the listener himself is more effective in inducing well-being, while classical music with low arousal promotes relaxation. Linnemann *et al.* (2017) and Thoma *et al.* (2013) showed that listening to music before a stressful situation improves physiological recovery. However, Kappert *et al.* (2019) indicated that the combination of music and linguistic media can also be effective.

Regarding emotional and physiological recovery, de la Torre-Luque *et al.* (2017) observed better results with preferred music. In addition, Gan *et al.* (2015) showed that sedative music is more effective than stimulating music in reducing anxiety. Asif *et al.* (2019) found that music in English reduces stress more than music in Urdu. Baltazar *et al.* (2019) and Groarke and Hogan (2019) concluded that the combination of appropriate strategies with appropriate musical interventions enhances emotional regulation and stress reduction, while Saarikallio *et al.* (2017) highlighted the importance of avoiding using music related to negative memories in adolescents.

On the other hand, Malakoutikhah *et al.* (2020) observed that several musical genres, except rock, reduce anxiety and pain, although without significant differences between them. Cakmak *et al.* (2017) found that music did reduce both anxiety and perceived pain in patients with lithotripsy, while Kongsawatvorakul *et al.* (2016) reported only relief of pain, but not anxiety, in surgical patients. Fallon *et al.* (2020) found that music listening reduced stress more than musical improvisation, and Groarke *et al.* (2019) also reported a reduction in anxiety about musical hearing. Van Dyck *et al.* (2017) noted that a substantial decrease in the rhythm of music has a significant impact on heart rate.

Finally, Tervaniemi *et al.* (2021) concluded that context influences emotional and hormonal responses to music. Fuentes-Sánchez *et al.* (2022) showed that musical preference

affects subjective and objective emotional responses. Juslin *et al.* (2008) stressed that musical emotions depend on personality and context, highlighting their importance for understanding emotional reactions.

Limitations and recommendations

This review has some limitations to consider. The number of studies that met the inclusion criteria is not very large, and most of them present a cross-sectional design with similar interventions and settings. It is recommended that research be carried out with more rigorous methodological designs, including longitudinal approaches that evaluate the sustained impact of music therapy incorporating approaches other than the receptive and professional figure of the music therapist in the reduction of stress in broader contexts. In addition, it is essential to develop standardized guidelines to ensure consistency in interventions, improve comparability between studies, and increase their replicability.

CONCLUSIONS

This review of the relationship between music therapy and stress reduction in healthy adults shows that music has a notable impact on the physiological and psychological sphere, positively impacting blood pressure, heart rate, cortisol levels and emotional well-being. However, these effects vary depending on factors such as music preference, social context, gender, and frequency of exposure to music.

The need to plan individualized interventions is underlined as a key aspect. The patient's musical preferences seem to be a crucial factor in their effectiveness, as they are more effective in reducing anxiety and promoting relaxation compared to other proposals. Likewise, although many studies have been conducted in controlled environments, more research is needed in natural contexts to understand how music can be integrated into people's daily lives.

In conclusion, music therapy is positioned as a promising, accessible, and cost-effective intervention for stress management. However, its effective implementation requires personalized approaches, more studies in everyday settings, and integration with other therapeutic strategies.

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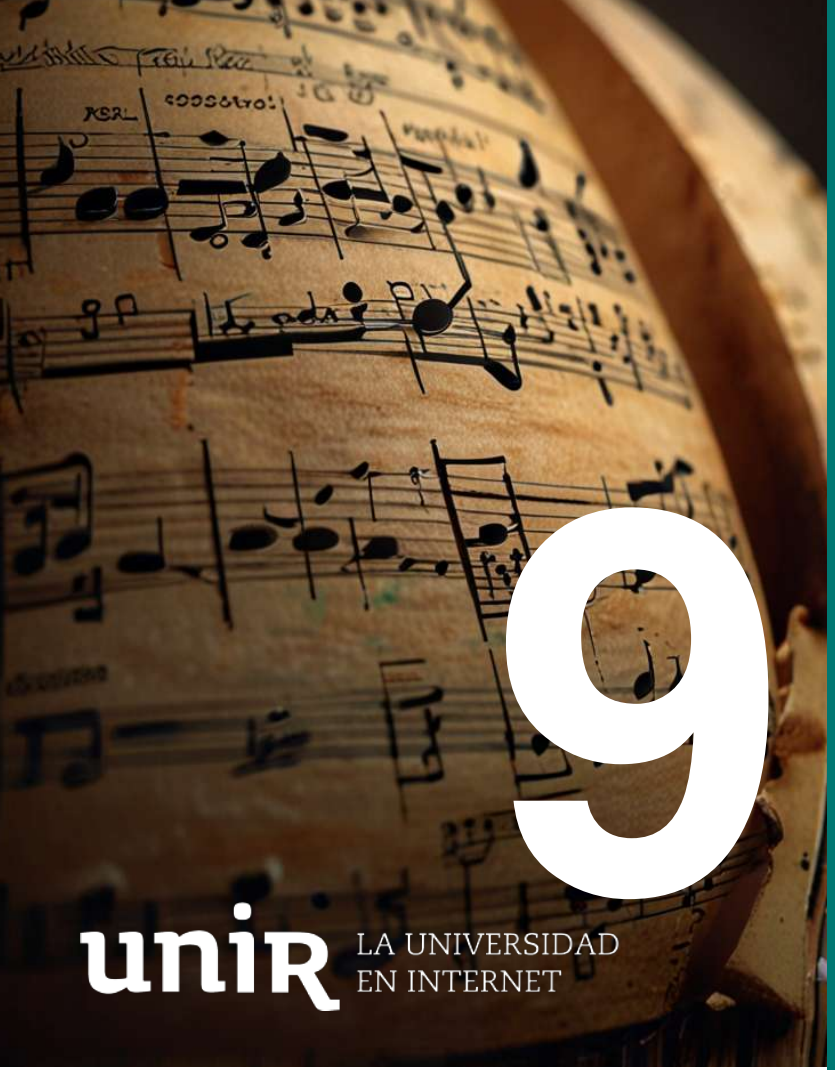

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