MISOSTENIDO
REVISTA DE MUSICOTERAPIA unir

#9,5

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

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

Antonio Guerrero-Sánchez
Graduate in Higher Artistic Music Education, specializing in Performance and Violin. He holds a Master's degree in Music Therapy and a Master's degree in Teacher Training
https://orcid.org/0009-0004-4392-0197

María Inmaculada Godoy-Gutiérrez
Advanced Degree in Composition and Musicology. Master's Degree in Music Therapy and Master's Degree in Musical Research. Professor of Composition
https://orcid.org/0009-0002-2024-0995

ACCESO ABIERTO

Citación recomendada
. (2025). Music Therapy for stress reduction in healthy adults: a systematic review [Musicoterapia para la reducción del estrés en adultos sanos: una revisión sistemática]. Misostenido, *5*(9), 43-52.
https://doi.org/10.59028/misostenido.2025.06

Correspondence
antonioviolinista2000@gmail.com

Received: 15 Ene 2025
Accepted: 25 Feb 2025
Published: 30 Mar 2025

Financing
This proposal does not have any institutional funding.

Competing interest
The authors of this proposal declare that they have no conflict of interest.

Authors contribution
The authors declare that they have developed this proposal and elaborated the paper.

Ethics approval
This study has not required ethics committee approval.

DOI:
https://doi.org/10.59028/misostenido.2025.06

Editorial design
PhD. David J. Gamella. Universidad Internacional de La Rioja (Spain)

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.

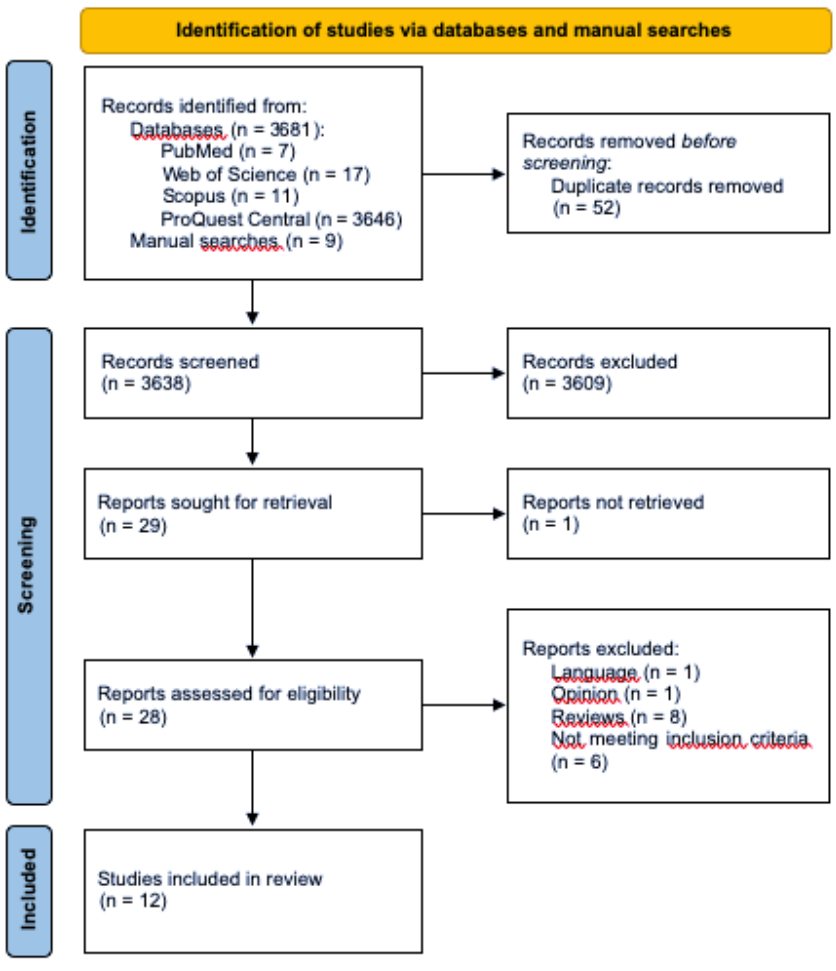
Selection procedure

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 / $\overline{X}$ = 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 / $\overline{X}$ = 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/ $\overline{X}$ =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 / $\overline{X}$ = 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 / $\overline{X}$ = 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/ $\overline{X}$ = 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/ $\overline{X}$ =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 / $\overline{X}$ = 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 / $\overline{X}$ = 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/ $\overline{X}$ =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) / $\overline{X}$ = 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.

REFERENCES

Adiasto, K., Beckers, D. G. J., Van Hooff, M. L. M., Roelofs, K., & Geurts, S. A. E. (2022). Music listening and stress recovery in healthy individuals: A systematic review with meta-analysis of experimental studies. *PLoS ONE, 17*(6), e0270031. https://doi.org/10.1371/journal.pone.0270031

Akimoto, K., Hu, A., Yamaguchi, T., & Kobayashi, H. (2019). Effect of 528 Hz Music on the Endocrine System and Autonomic Nervous System. *Health, 10*(9), 1159-1170. https://doi.org/10.4236/health.2018.109088

Amorós-Sánchez, B., Gamella-González, D.J., Cisneros-Álvarez, P., & Gisbert-Caudeli, V. (2024). A Systematic Review of the Technology Available for Data Collection and Assessment in Music Therapy. In: Brooks, A.L. (eds) *ArtsIT, Interactivity and Game Creation. ArtsIT 2023. Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering,* vol 564. Springer, Cham. https://doi.org/10.1007/978-3-031-55319-6_4

Asif, A., Majid, M., y Anwar, S. M. (2019). Human stress classification using EEG signals in response to music tracks. *Computers in Biology and Medicine, 107*, 182-196. https://doi.org/10.1016/j.compbiomed.2019.02.015

Baltazar, M., Västfjäll, D., Asutay, E., Koppel, L., & Saarikallio, S. (2019). Is it me or the music? Stress reduction and the role of regulation strategies and music. *Music & Science, 2*, 2059204319844161. https://doi.org/10.1177/2059204319844161

Cakmak, O., Cimen, S., Tarhan, H., Ekin, R. G., Akarken, I., Ulker, V., Celik, O., Yucel, C., Kisa, E., Ergani, B., Cetin, T., & Kozacioglu, Z. (2017). Listening to music during shock wave lithotripsy decreases anxiety, pain, and dissatisfaction. *Wiener Klinische Wochenschrift, 129*(19-20), 687-691. https://doi.org/10.1007/s00508-017-1212-0

Cao, M., & Zhang, Z. (2023). Adjuvant music therapy for patients with hypertension: a meta-analysis and systematic review. *BMC Complementary Medicine and Therapies, 23*(1), 110. https://doi.org/10.1186/s12906-023-03929-6

Chida, Y., & Steptoe, A. (2010). Greater Cardiovascular Responses to Laboratory Mental Stress Are Associated with Poor Subsequent Cardiovascular Risk Status: A Meta-Analysis of Prospective Evidence. *Hypertension, 55*(4), 1026-1032. https://doi.org/10.1161/hypertensionaha.109.146621

de la Torre-Luque, A., Caparrós-González, R. A., Bastard, T., Vico, F. J., & Buela-Casal, G. (2016). Acute stress recovery through listening to Melomics relaxing music: A randomized controlled trial. *Nordic Journal of Music Therapy, 26*(2), 124-141.

https://doi.org/10.1080/08098131.2015.1131186

de la Torre-Luque, A., Díaz-Piedra, C., & Buela-Casal, G. (2017). Effects of preferred relaxing music after acute stress exposure: A randomized controlled trial. *Psychology of Music, 45*(6), 795-813. https://doi.org/10.1177/0305735617689953

de Witte, M., Spruit, A., Van Hooren, S., Moonen, X., & Stams, G. (2020). Effects of music interventions on stress-related outcomes: a systematic review and two meta-analyses. *Health Psychology Review, 14*(2), 294-324. https://doi.org/10.1080/17437199.2019.1627897

Fallon, V. T., Rubenstein, S., Warfield, R., Ennerfelt, H., Hearn, B., & Leaver, E. (2020). Stress reduction from a musical intervention. *Psychomusicology: Music, Mind and Brain, 30*(1), 20-27. https://doi.org/10.1037/pmu0000246

Fernández-Company, J. F., García-Rodríguez, M. J., Ondé, D., & Calero-Aparicio, E. (2022). Eficacia de la Musicoterapia en la Satisfacción con los Roles y Actividades Sociales en Pacientes Neurológicos. *Revista Iberoamericana de Diagnóstico y Evaluación Psicológica, 66*(5), 91-104. https://doi.org/10.21865/ridep66.5.07

Fuentes-Sánchez, N., Pastor, R., Eerola, T., Escrig, M. A., & Pastor, M. C. (2022). Musical preference but not familiarity influences subjective ratings and psychophysiological correlates of music-induced emotions. *Personality and Individual Differences, 198*, 111828. https://doi.org/10.1016/j.paid.2022.111828

Gan, S. K., Lim, K. M., & Haw, Y. (2015). The relaxation effects of stimulative and sedative music on mathematics anxiety: A perception to physiology model. *Psychology of Music, 44*(4), 730-741. https://doi.org/10.1177/0305735615590430

García-Rodríguez, M., Alvarado, J. M., Fernández-Company, J. F., Jiménez, V., & Ivanova-Iotova, A. (2023). Music and facial emotion recognition and its relationship with alexithymia. *Psychology of Music, 51*(1), 259-273. https://doi.org/10.1177/03057356221091311

Gooding, L., Swezey, S., & Zwischenberger, J. B. (2012). Using Music Interventions in Perioperative Care. *Southern Medical Journal, 105*(9), 486-490. https://doi.org/10.1097/smj.0b013e318264450c

Groarke, J. M., Groarke, A., Hogan, M. J., Costello, L., & Lynch, D. (2019). Does Listening to Music Regulate Negative Affect in a Stressful Situation? Examining the Effects of Self-Selected and Researcher-Selected Music Using Both Silent and Active Controls. *Applied Psychology: Health and Well-being, 12*(2), 288-311. https://doi.org/10.1111/aphw.12185

Groarke, J. M., & Hogan, M. J. (2019). Listening to self-chosen music regulates induced negative affect for both younger and older adults. *PLoS ONE, 14*(6), e0218017. https://doi.org/10.1371/journal.pone.0218017

Gupta, U., & Gupta, B. S. (2015). Psychophysiological reactions to music in male coronary patients and healthy controls. *Psychology of Music, 43*(5), 736-755. https://doi.org/10.1177/0305735614536754

Jiang, J., Rickson, D., & Jiang, C. (2016). The mechanism of music for reducing psychological stress: Music preference as a mediator. *The Arts in Psychotherapy, 48*, 62-68. https://doi.org/10.1016/j.aip.2016.02.002

Jiang, J., Zhou, L., Rickson, D., & Jiang, C. (2013). The effects of sedative and stimulative music on stress reduction depend on music preference. *The Arts in Psychotherapy, 40*(2), 201-205. https://doi.org/10.1016/j.aip.2013.02.002

Juslin, P. N., Liljeström, S., Västfjäll, D., Barradas, G., & Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music, and situation. *Emotion, 8*(5), 668-683. https://doi.org/10.1037/a0013505

Kappert, M. B., Wuttke-Linnemann, A., Schlotz, W., & Nater, U. M. (2019). The Aim Justifies the Means—Differences Among Musical and Nonmusical Means of Relaxation or Activation Induction in Daily Life. *Frontiers in Human Neuroscience, 13*, 36. https://doi.org/10.3389/fnhum.2019.00036

Koelsch, S. (2020). A coordinate-based meta-analysis of music-evoked emotions. *NeuroImage, 223*, 117350. https://doi.org/10.1016/j.neuroimage.2020.117350

Koelsch, S., Boehlig, A., Hohenadel, M., Nitsche, I., Bauer, K., & Sack, U. (2016). The impact of acute stress on hormones and cytokines and how their recovery is affected by music-evoked positive mood. *Scientific Reports, 6*(1), 23008. https://doi.org/10.1038/srep23008

Kongsawatvorakul, C., Charakorn, C., Paiwattananupant, K., Lekskul, N., Rattanasiri, S., & Lertkhachonsuk, A. (2016). Limited Impact of Music Therapy on Patient Anxiety with

the Large Loop Excision of Transformation Zone Procedure - a Randomized Controlled Trial. *Asian Pacific Journal of Cancer Prevention, 17*(6), 2853-2856. https://pubmed.ncbi.nlm.nih.gov/27356701

Krause, A. E., Scott, W. G., Flynn, S., Foong, B., Goh, K., Wake, S., Miller, D., & Garvey, D. (2021). Listening to music to cope with everyday stressors. *Musicae Scientiae, 27*(1), 176-192. https://doi.org/10.1177/1029864921103031 8

Liljeström, S., Juslin, P. N., & Västfjäll, D. (2012). Experimental evidence of the roles of music choice, social context, and listener personality in emotional reactions to music. *Psychology of Music, 41*(5), 579-599. https://doi.org/10.1177/0305735612440615

Linnemann, A., Ditzen, B., Strahler, J., Doerr, J. M., & Nater, U. M. (2015). Music listening as a means of stress reduction in daily life. *Psychoneuroendocrinology, 60*, 82-90. https://doi.org/10.1016/j.psyneuen.2015.06.008

Linnemann, A., Strahler, J., & Nater, U. M. (2016). The stress-reducing effect of music listening varies depending on the social context. *Psychoneuroendocrinology, 72*, 97-105. https://doi.org/10.1016/j.psyneuen.2016.06.003

Linnemann, A., Wenzel, M., Grammes, J., Kubiak, T., & Nater, U. M. (2017). Music Listening and Stress in Daily Life—a Matter of Timing. *International Journal of Behavioral Medicine, 25*(2), 223-230. https://doi.org/10.1007/s12529-017-9697-5

Lynar, E., Cvejic, E., Schubert, E., & Vollmer-Conna, U. (2017). The joy of heartfelt music: An examination of emotional and physiological responses. *International Journal of Psychophysiology, 120*, 118-125. https://doi.org/10.1016/j.ijpsycho.2017.07.012

Malakoutikhah, A., Dehghan, M., Ghonchehpoorc, A., Afshar, P. P., & Honarmand, A. (2020). The effect of different genres of music and silence on relaxation and anxiety: A randomized controlled trial. *EXPLORE, 16*(6), 376-381. https://doi.org/10.1016/j.explore.2020.02.005

Matney, B. (2017). The effect of specific music instrumentation on anxiety reduction in university music students: A feasibility study. *The Arts in Psychotherapy, 54,* 47-55. https://doi.org/10.1016/j.aip.2017.02.006

Ministerio de Cultura y Deporte. (2019). Encuesta de hábitos y prácticas culturales en España 2018-2019. Secretaría General Técnica - Subdirección General de Atención al ciudadano, Documentación y Publicaciones. https://www.cultura.gob.es/va/dam/jcr:1712f192-d59b-427d-bbe0-db0f3e9f716b/encuesta-de-habitos-y-practicas-culturales-2018-2019.pdf

Nakajima, Y., Tanaka, N., Mima, T., & Izumi, S. (2016). Stress Recovery Effects of High- and Low-Frequency Amplified Music on Heart Rate Variability. *Behavioural Neurology, 2016*, 1-8. https://doi.org/10.1155/2016/5965894

Organización Mundial de la Salud (OMS). (2023). Estrés. https://www.who.int/news-room/questions-and-answers/item/stress

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ, 372*(71), 1-9. https://doi.org/10.1136/bmj.n71

Parada-Cabaleiro, E., Batliner, A., & Schedl, M. (2022). An Exploratory Study on the Acoustic Musical Properties to Decrease Self-Perceived Anxiety. *International Journal of Environmental Research and Public Health, 19*(2), 994. https://doi.org/10.3390/ijerph19020994

Radstaak, M., Geurts, S. A. E., Brosschot, J. F., & Kompier, M. A. J. (2014). Music and Psychophysiological Recovery from Stress. *Psychosomatic Medicine, 76*(7), 529-537. https://doi.org/10.1097/psy.0000000000000094

Saarikallio, S., Baltazar, M., & Västfjäll, D. (2017). Adolescents' musical relaxation: understanding related affective processing. *Nordic Journal of Music Therapy, 26*(4), 376-389. https://doi.org/10.1080/08098131.2016.1276097

Song, Y., Mewes, R., Skoluda, N., & Nater, U. M. (2023). How is music listening purpose related to stress recovery? – two preliminary studies in men and women. *Frontiers in Psychology, 14*, 1108402. https://doi.org/10.3389/fpsyg.2023.1108402

Tervaniemi, M., Makkonen, T., & Nie, P. (2021). Psychological and Physiological Signatures of Music Listening in Different Listening Environments—An Exploratory Study. *Brain Sciences, 11*(5), 593. https://doi.org/10.3390/brainsci11050593

Thoma, M. V., La Marca, R., Brönnimann, R., Finkel, L., Ehlert, U., & Nater, U. M. (2013). The Effect of Music on the Human Stress Response. *PLoS ONE, 8*(8), e70156. https://doi.org/10.1371/journal.pone.0070156

van Dyck, E., Six, J., Soyer, E., Denys, M., Bardijn, I., & Leman, M. (2017). Adopting a music-to-heart rate alignment strategy to measure the impact of music and its tempo on human heart rate. *Musicae Scientiae, 21*(4), 390-404. https://doi.org/10.1177/1029864917700706

World Federation of Music Therapy. (2011). Announcing WFMT's NEW Definition of Music Therapy [Comunicado de prensa]. https://www.wfmt.info/post/announcing-wfmts-new-definition-of-music-therapy

Wuttke-Linnemann, A., Nater, U. M., Ehlert, U., & Ditzen, B. (2019). Sex-specific Effects of Music Listening on Couples' Stress in Everyday Life. *Scientific Reports, 9*(1), 4880. https://doi.org/10.1038/s41598-019-40056-0

Yehuda, N. (2011). Music and Stress. *Journal of Adult Development, 18*(2), 85-94. https://doi.org/10.1007/s10804-010-9117-4

Imagen creada con Leonardo.ai por D. Gamella - Promt "investigación y musicoterapia"