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Impacts of Music Therapy Sessions in a Therapeutic Residential Service: An Exploratory Mixed-Methods Study

Impactos da Musicoterapia em um Serviço Residencial Terapêutico: Estudo Exploratório de Métodos Mistos

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Abstract: This research aimed to explore the impact of music therapy on cognitive development, emotional expression, and social interaction among elderly residents of a Therapeutic Residential Service (SRT). The study focused on individuals with a history of prolonged psychiatric hospitalizations. Method: Twelve weekly music therapy sessions were conducted. Qualitative data were collected through session reports and analyzed using text mining techniques. Quantitative data were obtained from the Cognitive Assessment of Elderly People in Music Therapy (ACPIM) and analyzed using the Reliable Change Index (RCI) and individual trajectory modeling. Results: Analysis revealed that music therapy significantly contributed to emotional expression and social interaction among residents, particularly through the evocation of autobiographical memories and the enhancement of group cohesion during musical experiences. Inter-individual analysis showed an average increase of 1 point in ACPIM scores per session ($p < 0.05$), indicating a statistically significant improvement

in cognitive function across sessions. Intra-individual analysis presented a reliable improvement in 70% of the residents, as confirmed by the Reliable Change Index (RCI). The individual trajectory analysis indicated cognitive patterns described by a linear harmonic model, showing cyclical fluctuations in scores across the sessions. Discussion: The findings suggest that music therapy may be an effective intervention for psychosocial rehabilitation in SRTs, promoting intra-individual cognitive development. However, inter-individual effects were not conclusively established, likely due to the small sample size or cognitive fluctuations. Future research with larger samples is needed to confirm these preliminary findings and test the model's applicability.

Keywords: music therapy. mental health. elderly. psychometrics. machine learning.

Resumo: Este estudo investigou os efeitos da musicoterapia em residentes de um Serviço Residencial Terapêutico (SRT) em Belo Horizonte, composto por pessoas idosas com histórico de internações psiquiátricas prolongadas, com uma abordagem de métodos mistos. Foram realizadas 12 sessões, uma vez por semana, com análise qualitativa dos relatos por meio de mineração de texto e quantitativa dos escores do instrumento de Avaliação Cognitiva de Pessoas Idosas em Musicoterapia (ACPIM). Os dados quantitativos foram analisados por meio do Índice de Mudança Confiável (IMC) e do modelamento das trajetórias individuais dos participantes. Qualitativamente, a musicoterapia contribuiu para a expressão emocional e a interação social dos residentes, especialmente por meio da evocação de memórias autobiográficas e da coesão grupal durante as experiências musicais de improvisação, recriação, audição e composição. O IMC apontou melhorias cognitivas intraindividuais confiáveis, de forma que 70% das pessoas residentes apresentou mudanças positivas. Além disso, a análise das trajetórias individuais revelou padrões cognitivos descritos por um modelo harmônico linear, indicando flutuações cíclicas nos escores ao longo das sessões, em vez de

uma progressão sigmoidal. Entretanto, os efeitos interindividuais foram limítrofes em termos de significância estatística, o que pode estar relacionado ao tamanho reduzido da amostra ou às próprias flutuações cognitivas. Este estudo sugere que a musicoterapia pode ser uma intervenção eficaz na reabilitação psicossocial em SRTs, promovendo desenvolvimento cognitivo intraindividual, embora as evidências no nível interindividual sejam limitadas. Futuros estudos devem considerar amostras maiores e replicar o modelo harmônico linear para verificar sua aplicabilidade.

Palavras-chave: musicoterapia. saúde mental. idosos. psicometria. aprendizado de máquina.

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1. Introduction

The Brazilian Psychiatric Reform, initiated in the 1970s, aimed to radically transform the mental healthcare model in Brazil, in response to the inhumane conditions and social isolation fostered by traditional psychiatric hospitals (Amarante, 1994; Devers, Rosa, 2007). In this context, Brazilian legislation reinforced these objectives with Law 10.216 of 2001, guaranteeing the rights of people with mental disorders. This law redefined the structure of mental health services and established a Psychosocial Care Network (Rede de Atenção Psicossocial - RAPs), providing continuous, integrated, and community-based care (Brasil, 2001).

As part of this restructuring process, Ministry of Health Ordinance No. 106/2000 (Brasil, 2000) mandated the creation of Therapeutic Residential Services (Serviço Residenciais Terapêuticos - SRTs) as a component of the Unified Health System (Sistema Único de Saúde - SUS). These services are intended for individuals with mental disorders who have been hospitalized for long periods in psychiatric hospitals and lack social or family support (de-Castro et al., 2021). SRTs are defined as community-based residences, divided into two types: Type I, for individuals undergoing deinstitutionalization with greater autonomy, and Type II, for those with greater dependency and need for intensive care (Brasil, 2004).

Although SRTs were established before Law 10.216/2001, their implementation, along with the Back Home program and the Psychiatric Hospitals Restructuring Program, represents one of the most significant efforts in deinstitutionalization within the mental health sector. However, since 2017, the deinstitutionalization process has faced substantial challenges, including the halting of psychiatric hospital closures and the allocation of funds to therapeutic communities associated with religious entities, resulting in a “data blackout” and weakening of the RAPs (Desinstitute; Weber, 2021; Moncau, 2022). Despite these setbacks, there were 126 SRTs in Minas Gerais in 2020 (Desinstitute; Weber, 2021), compared to 24 SRTs in the same state (Brasil, 2004).

Barbosa and collaborators (2023) reviewed the literature on SRTs and identified three main themes in these studies: 1) The process of recognizing and exercising autonomy among SRT residents depends on professional support and social inclusion; 2) Deinstitutionalization and autonomy for SRT residents occur when there is social integration and involvement of family members, professionals, and the community, along with a shift in perspective about these individuals. However, the implementation process remains uneven, with lingering prejudice and stigma; and 3) Professionals seek to build residents' autonomy through co-responsibility, though this process varies across services and depends on the professionals' perspectives, training, and working conditions (Barbosa et al., 2023). These themes highlight a strong focus on the social reintegration and autonomy of residents, while noting that the process of building this autonomy exhibits significant intra-individual differences.

SRTs are not direct health services, but rather spaces for communal living integrated into the RAPs of each municipality (Brasil, 2004). However, music therapy (MT) activities have been conducted in these services since 2019, as part of the extension project "Music Therapy in Mental Health" (SIEX-402786). A preliminary search performed on the CAPES database of journals[1] using the keywords "Therapeutic Residential Service" AND "Music Therapy" or "Therapeutic Residence" AND "Music Therapy" yielded no published studies on the topic. Most studies related to music therapy in the Brazilian mental health context are linked to Psychosocial Care Centers (CAPS), which are also part of the Psychosocial Care Network (Silva Júnior, 2023).

One student who participated in the aforementioned extension project developed an undergraduate thesis reporting their music therapy internship experience in a Therapeutic Residence (Silva, 2023). In this report, the author identified the following main

1 The Portal de Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Portal of Journals of the Coordination for the Improvement of Higher Education Personnel - CAPES) is a virtual scientific repository that contains over 50,000 full-text journals and 455 databases with diverse content, such as references, patents, statistics, audiovisual material, technical standards, theses, dissertations, books, and reference works.

results of the music therapy actions: a) a significant increase in the engagement and adherence of residents to music therapy sessions, with greater initiative and motivation to participate in musical activities; b) growth in group cohesion, where collective experiences, initially disorganized, became more coordinated, with residents finding common pathways for song development without the need for constant intervention; c) the evocation of autobiographical memories, with residents recalling both positive and negative memories associated with the songs used in the sessions; and d) role shifts among residents, where each individual, at different times, assumed leadership in musical activities, contributing to the appreciation of individuality and strengthening collective expression.

Since most SRT residents are elderly, it is relevant to examine the effects of MT on this population. A Cochrane review on the impact of MT with elderly people with dementia found that five sessions of MT or music-based activities could reduce depressive symptoms and improve overall behavioral difficulties at the end of treatment. There is limited evidence that MT improves emotional well-being and quality of life and reduces anxiety in institutionalized elderly individuals. It may have little or no effect on agitation, aggression, or cognition (van der Steen et al., 2018).

Conversely, another study investigated the efficacy of music therapy in a group of elderly people aiming to improve depression and slow cognitive function decline in 104 participants with dementia, who received 12 MT sessions (Chu et al., 2014). The results showed that the intervention reduced depression and slightly improved cognitive function, especially short-term memory, with more pronounced effects in individuals with mild to moderate dementia. The intervention was shown to be a non-invasive and low-cost approach to improving well-being and delaying cognitive decline in elderly people with dementia.

There are three key milestones in human cognitive development related to music and autobiographical memories over the course of life: 1) childhood amnesia, which refers to the inability of adults

to recall remember autobiographical memories before the age of 5 (Eysenck, 2010); 2) the reminiscence bump, which indicates that music heard between ages 15 and 24 is is more readily recalled and has a stronger relationship with autobiographical memories compared to music from other life stages (Platz et al., 2015); and 3) socioemotional selectivity theory, which indicates that elderly people process negative information more superficially than they process positive information (Carstensen et al., 1999).

In the Brazilian context, Silva Júnior (2016) conducted an experimental study based on these three milestones with a group of 20 elderly individuals, who participated in three conditions: passive music listening; clay activity with background music; and musical activities involving composition, appreciation, and performance. The study found that the third condition (musical activities of composition, appreciation, and performance) resulted in a higher frequency of autobiographical memory retrieval compared to the other conditions and also led to a qualitative increase in the richness of autobiographical memories.

Given the ongoing need for support for SRT residents and the potential for music therapy to contribute to their psychosocial well-being, this study aimed to investigate the impacts of music therapy sessions on residents of a Therapeutic Residential Service. To achieve this, we employed an exploratory mixed-methods approach, integrating qualitative text mining of session reports - a technique increasingly used to analyze therapeutic processes in music therapy (Nascimento et al., 2024; Pedrosa; Reis, 2022) - with quantitative modeling of individual cognitive trajectories, an approach recently applied in the Brazilian context (André et al., 2024; Gomes Vilero et al., 2025). This combination allowed for a nuanced exploration of both group dynamics and intra-individual development, addressing a gap in the literature on music therapy within SRTs.

2. Methods

2.1. Study Design

This study employed an exploratory mixed-methods design (Gil, 2017), combining quantitative and qualitative data, to investigate the impacts of music therapy sessions in a Therapeutic Residential Service (TRS). The research was conducted as part of the extension project Music Therapy in Mental Health (SIEX/UFMG - 402786).

2.2. Procedure and Setting

The sample consisted of residents of an SRT in Belo Horizonte, Brazil. Participants were of all genders and aged 18 and over. Data were generated during 12 weekly sessions in the first semester of 2024. The study protocol ensured that participants faced minimal risks.

2.3. Intervention

The MT sessions were conducted from a community-social perspective, aiming to transform the ecological, sociological, and psychological systems of the spaces and individuals, thereby strengthening and supporting participants in developing strategies for action, resistance, and survival (Cunha, 2016; Stige et al., 2016). Sessions were structured using neurologic music therapy techniques for warming up, followed by an interactive approach (Barcellos, 2016), which incorporated experiences of composition, listening, recreation, and improvisation, with an emphasis on body expression and group interaction as means to promote emotional well-being and self-awareness. Lastly, sessions were systematized with appreciation and/or listening techniques, allowing each resident to choose a song.

2.4. Measures

After each session, the interns wrote reports and completed an evaluation tool, the Cognitive Evaluation of Elderly People in Music Therapy (ACPIM). This is a hetero-report instrument consisting of 12 items, scored on a 5-point Likert scale (ranging from "never" to "always"). The instrument has adequate evidence of content, internal structure, and convergent validity with a cognition assessment tool (Arruda, 2022). The cutoff point is 33, and Cronbach's alpha of 0.96 attests to its internal consistency.

2.5. Data Analysis

All statistical analyses of the collected data were performed using RStudio v. 4.3.1 (R Core Team, 2023), with a significance level of $p < 0.05$.

Session reports were preprocessed and analyzed using text mining techniques. The analysis involved generating word clouds using wordcloud2 v. 0.2.1 (Lang; Chien, 2018), performing topic modeling with ldatuning v. 1.0.2 (Nikita; Chaney, 2020) and topicmodels v. 0.2.12 (Grün; Hornik, 2011), and conducting sentiment analysis with sentimentr v. 2.9.0 (Rinker, 2021).

ACPIM scores were analyzed to evaluate inter- and intra-individual change. A Generalized Estimating Equation (GEE) was used to assess group-level effects, with geepack v. 1.3.9 (Højsgaard et al., 2006). To determine if individual changes between the first and last sessions were significant, the Reliable Change Index (RCI) was calculated with the rciplot v. 0.1.1 package (Hagspiel, 2023). Individual developmental trajectories were modeled using a four-parameter logistic (4-PL) model and a harmonic linear model (HLM) to account for sigmoidal and cyclical patterns, respectively, with the nls. multstart v. 1.3.0 package (Padfield; Matheson, 2023). Model fit was assessed by the coefficient of determination (R^2). Cohen (1988) suggests $R^2 = 0.01$ (1%) as a weak prediction, $R^2 = 0.09$ (9%) as a moderate prediction, and $R^2 = 0.25$ (25%) as a strong prediction.

3. Results

Music therapy sessions were held at an SRT, once a week for twelve weeks. Participation from the residents fluctuated throughout the semester, with regular attendance observed for eight residents, 5 of whom were men. Three students facilitated the sessions. The average age of the participants was 63 years (SD = 11.06). Resident 1 and Resident 2 participated in 9 sessions, Resident 3 in 8, Resident 4 in 7, Resident 5 in 6, Resident 6 in 4, and Resident 7 in 2. Resident8 did not fully participate in any session from start to finish.

The sessions began with techniques such as Patterned Sensory Enhancement and Musical Speech Stimulation, which were not explicitly aimed at Neurological Music Therapy (Thaut; Hoemberg, 2016), but rather as a means to engage the residents in music therapy. In the second part of the sessions, music was used to foster connections between the students and residents, recall songs, explore musical instruments in relation to the songs, and support the residents' socialization. The first author conducted the internship supervision.

Some of the songs recalled included "Acorda Maria Bonita," "Asa Branca," and "Está Chegando a Hora"—iconic songs from Brazilian culture. A composition on the theme of "love" was created over the course of four sessions (from the fourth to the seventh session). Most of the songs performed during the sessions featured instruments such as the guitar, clarinet, recorder, and shakers.

The following sections present the results of text mining from the session reports and the quantitative analysis of the ACPIM scores.

3.1. Qualitative data

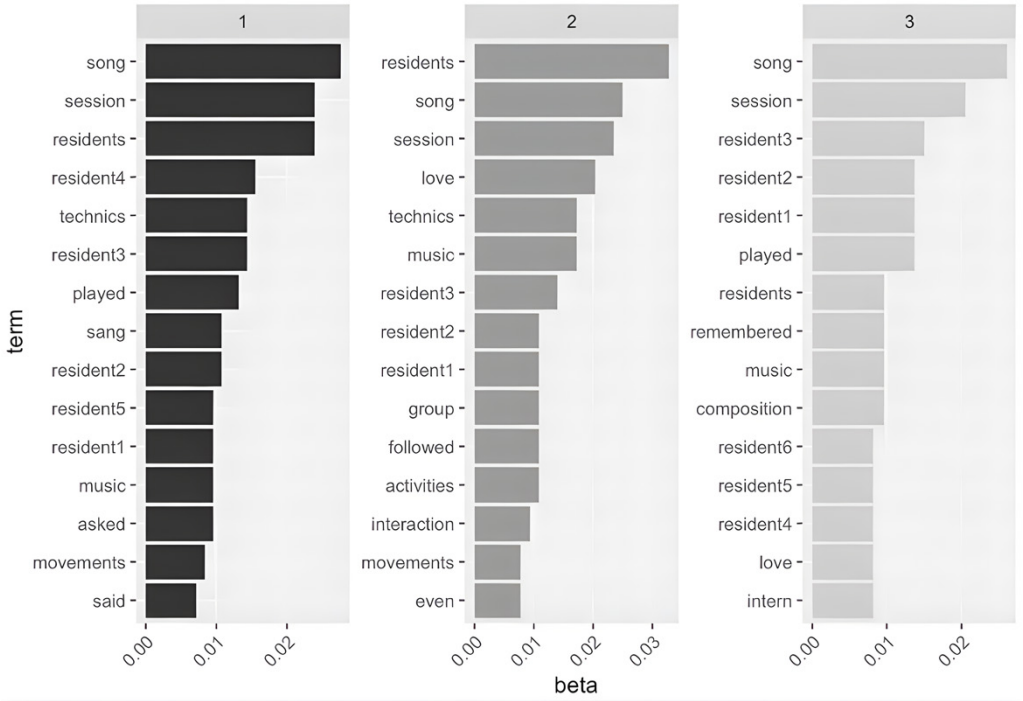
The qualitative data from session reports were preprocessed using text cleaning procedures. Figure 1 displays the most frequent words found in the session reports. Beyond identifying

group participants in music therapy by number (e.g., resident1), the reports describe the techniques and activities employed, interactions between students and residents, and songs as essential tools in the music therapy process. The word cloud also includes some Portuguese words (e.g., “está” [be] or “você” [you]), linked to the titles of songs performed.

Figure 1 - Wordcloud generated from the reports.

Topic modeling was employed to identify latent themes within the reports. Based on coherence metrics and the need for interpretability, a three-topic model was selected. The topics were named based on the semantic content of their top 15 most probable words (Figure 2): 1) Individual musical actions, 2) Group musical interactions, and 3) Composition and love-related memories. This analysis confirmed that songs were a central element in session dynamics and revealed a significant focus on a collective composition process centered on the theme of love.

Figure 2 - Words and weights in each topic.



Note. Beta = the probability of a given word being present in a given topic.

Finally, a sentiment analysis of the 120 sentences comprising the reports yielded a total sentiment score of 30, with a positive average score of 0.25 (SD = 0.25; min. = -0.38; max. = 1.0). This indicates that the interns' narrative reports predominantly conveyed a positive sentiment regarding the sessions, with few neutral or negative descriptions.

3.2. Quantitative data

Although the reports indicated a positive perception from the interns regarding the music therapy work conducted at the SRT, more robust data is necessary to assess the inter- and intra-individual development of the residents. To evaluate the effect of music therapy sessions on ACPIM scores, a Generalized Estimating Equation (GEE) model was applied. This method is robust for small samples and longitudinal measures, calibrated with a Gaussian distribution and an autoregressive correlation matrix.

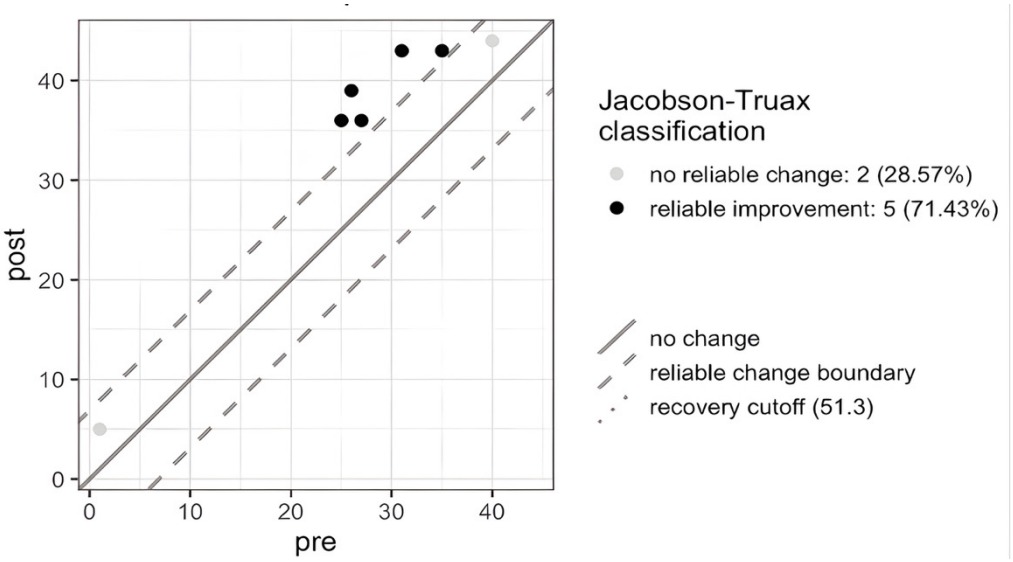
Results from the GEE analysis showed that each session contributed to a 1.01 increase in ACPIM scores, although the significance was marginal ($p = 0.049$), suggesting cautious interpretation. The model explained 5.53% of the variance in the data ($R^2 = 0.05$), indicating a weak predictive capacity (Cohen, 1988).

When demographic variables (sex, age) and their interactions were included, the model revealed that each additional session increased the ACPIM score by 1.16 units ($p < 0.05$); men had lower scores than women ($p < 0.01$); each additional year of age reduced the score by 1.62 units ($p < 0.05$); and the interaction between male gender and age was significant ($p < 0.01$), indicating that the relationship between age and cognitive score varies by gender. This model demonstrated a large effect size, accounting for 54.1% of the variance in the data ($R^2 = 0.54$).

Before calculating the Reliable Change Index (RCI), it is necessary to consider that Cronbach's alpha index has reliability issues (Sijtsma, 2009). Therefore, composite reliability (CR) was also calculated using the table provided by Analysis INN (2020). The CR result was 0.96. A new cutoff point was also calculated, considering that the population in this study is different from the one used in developing the measurement instrument (Arruda, 2022). To do this, the mean of the first measurement scores was added twice the standard deviation of that measurement (Aguiar et al., 2021). The cutoff point value was 51.3.

Results indicated that five of the seven participants (71%) showed a Reliable Positive Change (RPC): Resident 1 (RCI = 2.27), Resident 2 (RCI = 2.56), Resident 3 (RCI = 3.41), Resident 5 (RCI = 3.70), and Resident 6 (RCI = 3.13). The remaining two participants, Resident 4 (RCI = 1.14) and Resident 7 (RCI = 1.14), showed no reliable change. No resident exhibited a Reliable Negative Change (RNC). Despite these reliable improvements, no participant reached the study's calculated cutoff for clinical significance (Figure 3).

Figure 3 - Graph of reliable changes and clinical significance indexes.



Although it is possible to assess score changes between the first and last participation, it was not possible to reliably determine more about each resident's developmental trajectory. Data from Resident 7, who had only two ACPIM scores, were excluded from this analysis. Table 1 shows that the model was able to explain, with a considerable effect size ($R^2 > 0.70$), the scores of four out of six residents. In all models, the slope was positive, indicating that the intra-individual trajectory was upward. However, the model provided a poor fit for Residents 2 and 4, and visual inspection of their trajectories suggested cyclical patterns (Figure 4).

Table 1 - 4-PL model results.

Resident	Lower Asymptote	Upper Asymptote	Inflection Point	Hill Slope	Residual	R^2
1	31.30	46.70	6.62	12	63.9	0.72
2	20.30	39.30	5.78	0.96	317	0.14
3	31.30	44.30	4.94	4.14	26.7	0.83
4	-0.30	8.30	3.45	1.19	32.4	0.33
5	17.30	39	4.08	97.9	83.1	0.83
6	25.30	39.70	2	43.9	20.1	0.84

Note. R^2 = coefficient of determination, percentage of explained variance.

Due to the low explanatory power of the trajectories for Residents 2 and 4 using the 4-PL model, combined with the fact that the data trajectory shows both fluctuations over time and growth trends (Figure 4), a harmonic linear model (HL) was developed to estimate these trajectories more robustly (Pedrosa, 2024a). The resulting model exhibits a wave shape and can capture periodic patterns, particularly for trajectories that exhibit cyclical patterns not captured by the 4-PL model. In such cases, a harmonic linear model (HLM) was applied to robustly estimate growth trends amidst fluctuations (Pedrosa, 2024a). The HLM simultaneously models a linear trend (including the intercept and slope) and periodic oscillations (sinusoidal/cosine coefficients, as well as frequency). The overall variance explained was evaluated using the R^2 statistic.

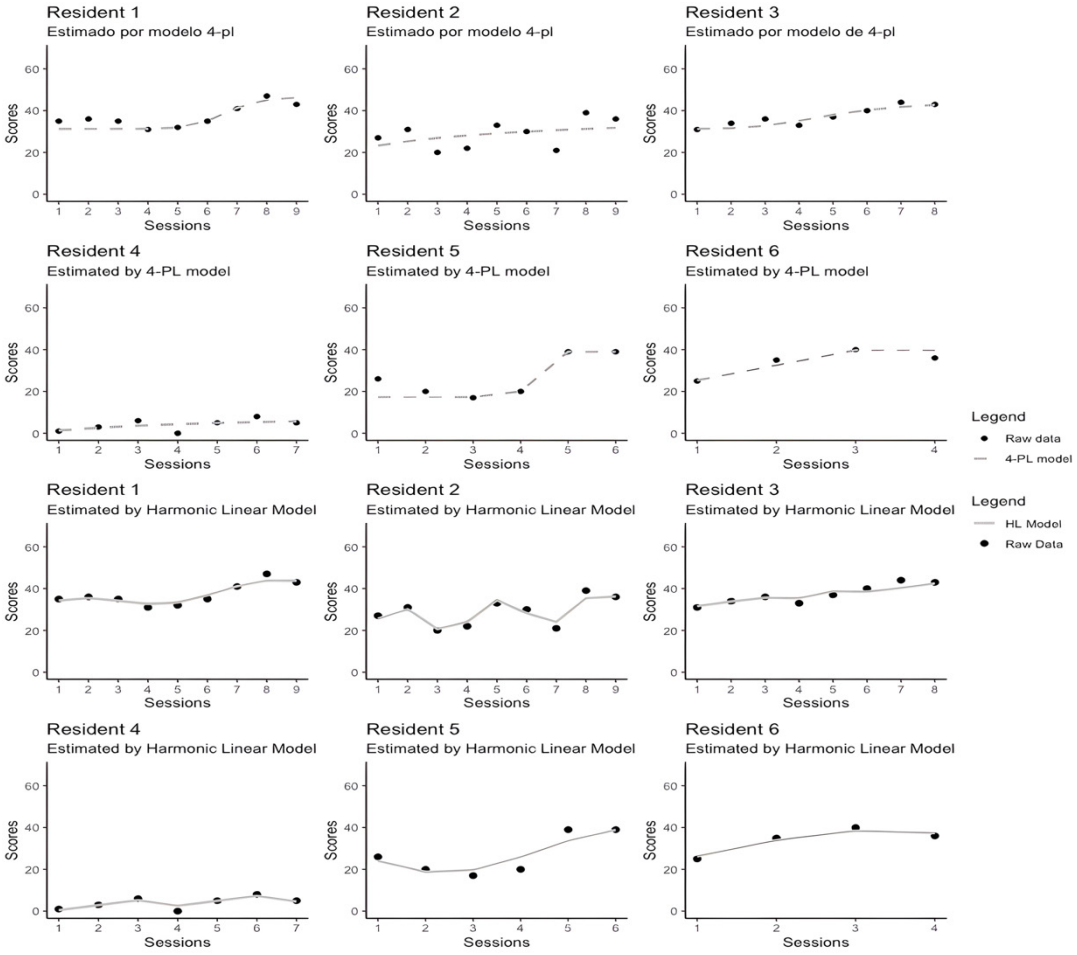
Table 2 - Harmonic Linear Model results.

Resident	Harmonic Intercept	Sine Coefficient	Cosine Coefficient	Linear Trend	Frequency	Linear Intercept	Linear Slope	R^2
1	29.69	48.84	0.98	1.31	0.96	30.47	1.35	0.91
2	22.27	0.35	-8.19	1.09	1.84	22.94	1.16	0.90
3	34.80	0.45	3.22	0.41	2.47	29.21	1.79	0.84
4	16.60	-1.33	2.35	0.67	2.09	1.00	0.75	0.83
5	44.28	19.72	-0.78	-3.65	-0.71	14.33	3.57	0.85
6	26.27	4.74	-0.49	3.30	4.53	24.50	3.80	0.94

The harmonic linear models (HL) explained the variance in the data for all residents with perfect effect sizes. However, it is essential to note that the negative frequency found for Resident5 indicates no cyclical oscillations in the data. Overall, the graphical inspection of the 4-PL model for Resident5 (Figure 4) confirms that the trajectory closely aligns with the definition of growth estimated by a sigmoid curve. The 4-PL models for Residents 2 and 4, on the other hand, had low explanatory power. In this sense, the HL models were able to explain their trajectories with a significant effect size, and both the linear trend and the slope indicated a growth trajectory, albeit cyclical. The trajectories estimated by both the 4-PL and HL models for Residents 1, 3, and 6 explained the data

variance well. However, visual inspection of the graphs suggests that the raw data trajectory tends more toward harmonicity, combined with a slight trend toward greater variance explanation. Both models confirmed a growth trajectory.

Figure 4 - Graph of the Intraindividual Music Therapy Individual Trajectory via Four-Parameter Logistic Model (4-PL) and Harmonic Linear Model (HLM).



To facilitate the estimation of individuals' trajectories, the first author of this work developed an entirely hands-on application (Pedrosa, 2024b). In the next section, the results and their implications will be discussed in consideration of previous research.

4. Discussion

The reports from the music therapy sessions primarily addressed the following themes: 1) individual musical activities of the residents; 2) group musical interactions; and 3) recollection and composition of songs. Sentiment analysis indicated a positive evaluation of these themes, suggesting favorable developments during the sessions. Notably, these themes and sentiments align with Silva's (2023) findings on residents' adherence to music therapy, group cohesion, and the evocation of autobiographical memories. They also reflect Silva Junior's (2016) observations on musical activities—composition, appreciation, and performance—that enhance autobiographical memory recall.

The temporal effect of the sessions was supported by quantitative studies on their impact on intraindividual development and the IMC. The borderline statistical significance at the interindividual level could be attributed to the sample size, as the significance of the effect is closely related to sample power (Miola & Miot, 2021), or to potential cognitive fluctuations within this population. Future studies aiming to verify interindividual effects should consider increasing sample size to assess if there are significant changes in the effect size captured by the GEE.

When additional variables were included in the model, the effect of the sessions became statistically significant, with each session increasing the ACPIM score by one point. The research found that age had a negative impact on ACPIM scores, with men scoring lower than women ($p < 0.01$). Additionally, the interaction between male gender and age was significant, indicating that the relationship between age and cognitive score varied by gender ($p < 0.01$). Neri (2014) notes a higher prevalence of cognitive deficits and memory problems among elderly women compared to men, though both experience normative declines in sensory abilities and processing speed. In this study, however, the results reversed Neri's findings.

The RCI revealed that 70% of the sample experienced reliable positive change, with none showing reliable negative change. While this data supports the reliability of individual changes, it does not clarify the specific developmental trajectory throughout the sessions. The 4-PL model estimates showed that 83.3% of the population had a positive trajectory, indicating that music therapy sessions had a favorable impact on a significant portion of participants, which aligns with interns' observations. The 4-PL models also showed a positive hill slope and a stabilization phase (Inflection Point) ranging from 2 to 6.62, with a mean of 4.48 (SD = 1.66). This suggests that, on average, most participants needed about five sessions to stabilize their scores positively.

The 4-PL model indicates sigmoidal development, characterized by an "S"-shaped curve with an initial slow phase, followed by rapid growth, and then stabilization. However, in many cases, participants' data were better explained by a harmonic linear model, suggesting cyclical fluctuations in scores. These fluctuations align with cognitive fluctuation theory, which describes spontaneous and transient changes in alertness and cognition, including symptoms such as drowsiness, lethargy, disorganized thought flow, and prolonged periods of "staring" (Escandon et al., 2010; Lee et al., 2012). Such fluctuations can occur in individuals without primary health conditions as well as in patients with neurodegenerative diseases like Alzheimer's, dementia with Lewy bodies, and behavioral variant frontotemporal dementia (Escandon et al., 2010).

Future research should consider measuring the elderly population over multiple time points. Salthouse (2016) argues that cross-sectional studies show significant declines in abilities between the ages of 40 and 50, but longitudinal studies reveal such declines only after the age of 60. This study found that music therapy may have a notable intraindividual impact, despite borderline interpersonal effects.

These results are consistent with those of van der Steen and collaborators (2018), who reported that music therapy may have a minimal or no effect on the cognition of older adults at the

interpersonal level. However, at the intrapersonal level, this study's findings align with Chu et al. (2014), who found that music therapy interventions improved cognitive function, particularly memory.

In the systematic review conducted by García-Casares et al (2017), 21 studies were selected to investigate the effects of music therapy on psychiatric and psychological symptoms, memory, language, communication, and participation. Music therapy, particularly active music therapy, in which patients participate by singing or playing musical instruments, has been demonstrated to be an effective non-pharmacological intervention, particularly for cognitive aspects such as memory, attention, and language, in patients with neurodegenerative disorders.

Based on a systematic review by Guiyue et al. (2023), music interventions have been shown to improve the health outcomes of older adults with various health conditions, including chronic diseases and mental health disorders. This suggests that music could be a safe and effective strategy for implementing health programs for older adults, such as those with dementia and mild anxiety and depression.

In the Cochrane review conducted by van der Steen et al. (2025) on music-based therapeutic interventions for people with dementia, the authors identified 30 studies conducted in 15 countries. The studies involved 1,720 people with dementia. In most studies, participants lived in nursing homes. Randomized clinical trials of music-based therapeutic interventions (of at least five sessions) were included. Music-based therapeutic interventions probably improve depression and may improve overall behavioral problems, compared with providing usual care. Also, it may improve behavior compared to other activities.

The study also identifies significant limitations related to the Brazilian Psychiatric Reform's key themes, as noted by Barbosa et al. (2022). One limitation is the limited involvement of students due to reduced working hours in RAPs, hindering a comprehensive analysis of music therapy's impact. Another limitation concerns

the use of psychometric instruments in mental health. While this field is growing in terms of measurement tools and demonstrating the effectiveness of practice (Pedrosa, 2023; Pedrosa et al., 2024), future research should explore mixed-methods approaches to reveal music therapy's network effects and assess its potential contributions to the autonomy of SRT residents.

Despite the promising findings regarding intra-individual development, several limitations must be considered when interpreting the results of this study. First, the small sample size (n = 8) limits the generalizability of our findings to the broader population of SRT residents. This limitation likely contributed to the borderline statistical significance observed in the inter-individual analysis (GEE), as the study may have been underpowered to detect small but meaningful group-level effects. Consequently, while our results strongly support an intra-individual impact, conclusions about the intervention's average effect across residents should be drawn with caution.

Second, while the application of advanced trajectory models provided novel insights, their explanatory power is also contingent on the limited dataset. The use of the 4-PL and harmonic linear models should be considered exploratory in this context. Although these models fit the data well, their parameters could be sensitive to the small number of data points per resident.

Future research is essential to validate these findings. Studies with larger, multi-site samples are needed to confirm the inter-individual effects of music therapy and to test the robustness and applicability of the harmonic linear model for describing cognitive fluctuations in this population

5. Final Considerations

The study provides initial evidence on the relevance of music therapy in Therapeutic Residential Services (SRTs) within the Brazilian Psychiatric Reform, particularly for elderly populations

with histories of prolonged psychiatric hospitalizations. Music therapy in SRTs demonstrated positive effects on intrapersonal cognitive aspects, with less impact at the interpersonal level.

Quantitative analyses, using the Reliable Change Index (RCI) and individual trajectory tracking, revealed individual differences in music therapy effects, with consistently positive or neutral outcomes, never negative. These improvements were complemented by qualitative insights from session reports, showing enhancements in participants' emotional expression and social interaction through music therapy techniques.

The study's findings suggest that intraindividual development follows a harmonic linear pattern, which is crucial for guiding future research on cognitive aspects in elderly individuals. Overall, this study contributes to understanding music therapy's benefits in residential care contexts, suggesting its effectiveness in promoting psychosocial rehabilitation and offering relevant insights into longitudinal cognitive development within the framework of Psychiatric Reform.

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Research ethics committee approval

This research was approved by the Ethics Committee of the Estadual University of Paraná (Brazil) under the code CAAE 40718520.0.0000.9247.

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