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DANCE AS A STRATEGY TO IMPROVE BALANCE IN YOUNG PEOPLE WITH DEAFNESS

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ABSTRACT

Human hearing plays a fundamental role in quality of life, especially in motor development, spatial and temporal perception. Studies indicate that deafness can compromise these functions, increasing the risks of bodily instability and directly impacting mobility and independence. Objective: This study sought to analyze the effects of dance interventions on the balance of deaf children. Methods: We included 18 children of both sexes, aged between 6 and 14 years, attended by the Deaf Person Service (SAPS) of the University of Vale do Itajaí. Participants were divided into two groups: intervention (10 children) and control (8 children). The intervention group participated in eight sessions of adapted Hip Hop classes, while the control group performed manipulation activities and manual games. Balance was assessed using the Berg test, which consists of 14 specific tasks that analyze body stability in different situations. Results: A significant improvement in the balance of the children in the intervention group was observed, evidenced by the increase in the scores of the Berg Test after dance classes. On the other hand, the control group did not present relevant changes in the same parameters. Conclusion: Dance, especially adapted Hip Hop, proved to be an effective strategy to improve balance in deaf children, offering a promising approach for motor development and social inclusion of this population. These findings reinforce the importance of body practices in promoting health and quality of life in children with hearing impairment.

Keywords: Deafness. Body Activities. Postural Stability. Motor Rehabilitation.

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INTRODUCTION

Deafness significantly impacts the quality of life of individuals, affecting social, physical and emotional aspects. This sensory deficit limits communication and language (De Oliveira Santos, 2021), interferes with motor development (Gonçalves, 2022), and impairs spatial and temporal perception (Fenske, 2015). These limitations can culminate in challenges in social interaction and daily activities, especially during childhood and adolescence, crucial periods for human development.

Balance, an essential skill for performing functional and motor activities, can be compromised by deafness. According to De Araújo Júnior, Amorim and De Amorim (2021), hearing loss directly affects balance due to the relationship between the auditory system and the vestibular system, responsible for body stability. Azevedo (2009) highlights that the maintenance of balance requires the anatomical and functional integrity of the vestibular apparatus, in addition to an efficient interaction between the visual, proprioceptive, musculoskeletal systems and nervous centers. Comparative studies corroborate this perspective. De Souza *et al*. (2010) observed that deaf children have greater body sway and lower balance compared to hearing children of the same age and gender, evidencing the impact of deafness on motor performance.

The assessment of equilibrium in specific populations requires appropriate methods that consider the individuality of the subjects. Da Costa Rocha *et al*. (2019) recommend the use of scales that are sensitive to the biological particularities and purposes of the diagnosis. In a similar analysis, Lima, Pereira and Moraes (2011) identified that hearing groups perform slightly better than people with deafness in balance tests. These results reinforce the need to explore interventions capable of mitigating deficits related to deafness, focusing on body practices that promote postural stability.

In this context, dance emerges as a promising alternative. In addition to its cultural and emotional expression, dance offers multiple physical and cognitive benefits. Montezuma *et al*. (2011) highlight that dance activities develop coordinated and synchronized movements, improve motor skills and social interaction, and raise the self-esteem of practitioners. For individuals who are deaf, these characteristics are especially relevant, as they can contribute to overcoming the barriers imposed by hearing impairment.

The literature points out that the practice of dance can promote improvements in motor coordination, flexibility and balance. For example, studies report that structured dance classes help in the development of fine and gross motor skills, which are essential for autonomy and quality of life (Montezuma *et al*., 2011). In addition, the use of musical

rhythms during classes favors body and spatial perception, aspects often impaired by the absence of auditory stimuli.

For deaf children and adolescents, dance represents not only a tool for inclusion, but also an intervention strategy that integrates sensory, motor and emotional aspects. Santana, Lobo and Dos Santo Silva (2021) argue that bodily activities, such as dance, promote socialization and expand motor experiences, enhancing global development. This approach aligns with the need for practices that go beyond the rehabilitative aspect, incorporating playful and educational elements that favor learning and well-being.

In addition, recent studies highlight the importance of the social environment and family interactions in the motor development of deaf children. Negrelli and Marcon (2006) emphasize that the family plays a crucial role in providing stimuli that positively influence behavior and motor learning. In parallel, Uysal *et al*. (2010) point out that children with profound hearing impairment depend more intensely on the visual and somatosensory systems to compensate for the absence of hearing, which can be enhanced by activities that require coordination and visual attention, such as dancing.

Although the sensory limitations imposed by deafness represent significant challenges, they also open space to explore innovative interventions that consider the adaptive potential of individuals. In this sense, dance can act as a pedagogical and therapeutic tool, promoting engagement and the development of motor and social skills. According to Ribeiro and Cavassan (2013), motor development is influenced both by phylogenetic factors, related to biological maturation, and by ontogenetic factors, which depend on lived experiences. This reinforces the need to provide enriching motor experiences during childhood and adolescence.

The choice of dance style is also a relevant aspect to consider. In this study, we opted for adapted Hip Hop, a style characterized by energetic and rhythmic movements that challenge balance and coordination. The structure of Hip Hop allows the gradual introduction of basic movements, respecting individual limitations and promoting motor progression. In addition, its dynamic nature favors the engagement of participants, making classes more attractive and stimulating.

In view of the above, there is a need to investigate the impact of dance interventions on the balance of deaf children and adolescents, especially in a context in which inclusive and adapted practices are essential. This study, therefore, seeks to fill a gap in the literature by analyzing how dance classes can contribute to the development of balance in this population. Thus, the present study aims to evaluate the efficacy of adapted Hip Hop in improving the balance of deaf children and adolescents, using the Berg Test as a

measurement tool. By exploring this relationship, it is expected to contribute to the development of educational and therapeutic strategies that expand the opportunities for inclusion and quality of life for individuals with deafness.

METHODS AND MATERIALS

This research had the participation of 18 students assisted by the Deaf Person Care Service (SAPS), a social and extension project linked to the Speech Therapy course at the University of Vale do Itajaí (UNIVALI), located in the city of Itajaí, Santa Catarina. The group of participants, composed of children and adolescents, was divided into two groups: the intervention group, formed by 10 individuals, and the control group, with 8 individuals.

As an inclusion criterion, the participants had moderate to profound hearing loss. Upon entering SAPS, students underwent periodic audiological evaluations conducted by speech therapists, with the objective of monitoring and classifying the hearing condition of each individual.

Table 1 – Characteristics of the volunteers' groups expressed as mean and ± standard deviation.

	n	Age (years)	Deafness		Stature (m)
Everyone	18	8.8 ± 3.7	Neurossensorial Deep bilateral		1.34 ± 0.17
Group 1 "Intervention"	10	8.2 ± 2.6	Neurossensorial Deep bilateral		1.28 ± 0.62
Group 2 "Control"	8	10.1 ± 4.7	Neurossensorial Deep bilateral		1.41 ± 0.24

n: Sample number; ± standard deviation of the means./Source: Prepared by the authors (2024).

The research was submitted to the Research Ethics Committee (CEP) of the University of Vale do Itajaí and approved under CAAE 56299816.5.0000.0120 (Opinion Number: 1.598.182). As this was a study involving human beings, all underage participants signed the Consent Form, while parents or legal guardians authorized participation through the Informed Consent Form, complemented by the Consent Forms for the use of photos, videos and recordings. All procedures strictly followed the ethical standards established by Resolution No. 466/12, respecting national and international guidelines for research with human beings.

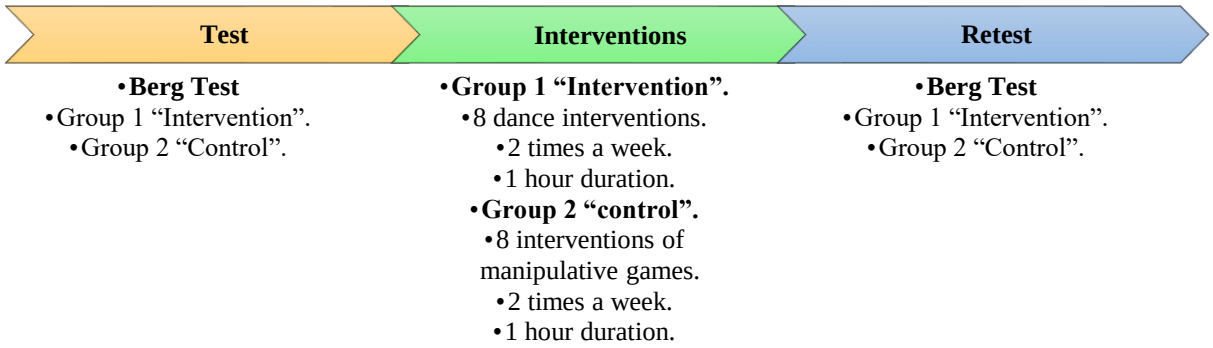
Before the start of data collection, a meeting was held with the participants, in which the objectives and protocol of the study were presented in detail. The meeting also addressed the importance of research and was attended by a Libras interpreter to ensure full understanding by participants with deafness.

To assess balance, the Berg Test (1992) was used, which consists of 14 steps involving movements such as turning, standing single-legged and transferring the center of

mass. This instrument evaluates and classifies the individual's balance. The test was applied at the beginning and end of a one-month intervention period, during which there were eight dance sessions, held twice a week, lasting one hour each.

Participants were organized into two groups: intervention and control. The allocation in the groups considered the days of the week and the number of students in each class. The intervention group classes took place on Mondays and Wednesdays, while the control group carried out its activities on Tuesdays and Thursdays. The detailed explanation of the tests was carried out in Libras, with the support of a SAPS interpreter, ensuring that everyone clearly understood the procedures.

Figure 1 - Sample design of the test and retest.



Source: Prepared by the authors (2023).

The 18 individuals participating in this study were organized into two distinct groups. The first, called the intervention group, had ten individuals, while the remaining eight made up the control group. The intervention group participated in adapted Hip Hop classes, while the control group performed manipulation activities and manual games.

The protocol of the dance classes was developed based on the principles of the Hip Hop style, emphasizing motor coordination and the fundamental movements of this modality. The classes included exercises such as jumping, squatting and spinning, focusing on isolated steps and basic movements that precede choreographic compositions, without the execution of complete choreographies. The use of musical counting was essential to maintain the rhythm and synchronize the movements of the participants, adapting them to the needs of the intervention group.

The musical rhythm played a central role in the intervention carried out with the dance group, being carefully adapted to the needs of the participants with hearing impairment. To ensure engagement and synchronization of movements, songs characteristic of the Hip Hop style were used, with accelerated and well-defined beats. These beats were amplified through powerful speakers strategically positioned in the

environment, allowing participants to feel the vibrations of the sound waves on the floor and walls of the room.

This adaptation strategy was fundamental for deaf children and adolescents to be able to capture the rhythm of music, even without direct hearing access. The vibrations served as an additional sensory reference, helping to synchronize the movements and maintain time during the proposed exercises. This approach reinforces the importance of integrating tactile and vibratory stimuli into musical activities aimed at people with hearing impairment, increasing the accessibility and effectiveness of interventions.

The data collected during the tests were tabulated in Microsoft Excel and statistically analyzed using the SPSS® program (Version 26.0, United States). For all tests, a confidence level of 95% ($p<0.05$) was adopted.

The normality of the data was verified using the Shapiro-Wilk test. As the data had a non-normal distribution, the Wilcoxon test was applied, a non-parametric test suitable for measured data of this nature (Lapa, 2021). This statistical approach made it possible to assess the differences between the groups and measure the effectiveness of the proposed interventions.

RESULTS AND DISCUSSION

This study evaluated the effectiveness of dance in improving balance in deaf children and adolescents, using the Berg Test as an analysis tool. The results obtained are summarized in Chart 1, which shows the correlation between the variables evaluated in the intervention and control groups. These data provide a basis for understanding the impacts of adapted dance interventions on participants' balance.

The results obtained show significant differences between the groups, allowing a detailed analysis of the effects of the adapted dance protocol on body balance. Next, each relevant aspect of the results will be discussed, considering the findings of this study in comparison with the existing literature.

Chart 1 - Wilcoxon analysis with variance between the groups.

Group	Hypothetical null	Sig.	Decision
Group 1 - (intervention)	The test results are the same for both groups.	0,001	Reject the null hypothesis.
Group 2 - (control)		0,235	There is no evidence to reject the null hypothesis.

Source: Prepared by the authors (2023).

The Berg Test demonstrated significant improvements in the body stability of deaf children and adolescents after the intervention with dance classes. This reinforces the

effectiveness of dance as a method of improving motor coordination, as pointed out by Uysal *et al*. (2010). The authors point out that children with profound hearing impairment tend to depend mostly on the visual and somatosensory senses to compensate for the absence of hearing, which contributes to a more efficient adaptation to the motor demands proposed by the practice of dance. This finding is consistent with the results of De Araújo Júnior, Amorim and De Amorim (2021), who also highlighted the relevance of physical activities for the motor development of individuals with deafness.

The role of the Hip Hop style in improving the scores of the Berg Test can be better understood by analyzing the specific characteristics of this dance modality. Hip Hop, with its dynamic and challenging movements such as jumps, turns, and rapid changes of direction, requires constant adjustments in the center of gravity and postural stability. These characteristics have the potential to improve motor coordination, static and dynamic balance, as well as proprioception, aspects directly related to the skills assessed by the Berg Test (Montezuma *et al*., 2011). In addition, the adaptation of Hip Hop for children includes the use of striking rhythmic beats and vibrations coming from the speakers, creating a sensory experience that facilitates the synchronization of movements and the engagement of the participants. Previous studies have already shown that the combination of motor activities with sensory stimuli can enhance the results with sensory impairments, reinforcing the connection between adapted Hip Hop and gains in postural balance (Uysal *et al*., 2010). In addition, the dance protocol used in this study included striking rhythmic beats and vibrations from the speakers, adapted to the needs of the deaf participants. These sensory adaptations were designed to compensate for the absence of auditory stimuli, offering a tactile experience that facilitated the perception of rhythm and the synchronization of movements. Recent studies, such as those by Hedayatjoo *et al*. (2020) and Azadian *et al*. (2023), highlight the importance of integrating somatosensory and visual stimuli into motor interventions, reinforcing the relevance of these adaptations in the context of adapted Hip Hop.

Another aspect to be considered is that, although the sensory factor is central to the results presented, it cannot be considered in isolation. The child's social and family context is a determining element for motor stimulation and learning during childhood. Ribeiro and Cavassan (2013) elucidate that, while phylogenetic functions depend primarily on maturation, ontogenetic functions are shaped by lived experiences, making the environment in which the child is inserted fundamental for his progress.

Also, Uysal *et al*. (2010) emphasize that social and family factors play a crucial role in the development process of the person with hearing impairment. Environments with

insufficient social and physical stimuli can lead to significant delays in the learning and developmental stages. Negrelli and Marcon (2006) highlight that the family constitutes the first nucleus of socialization, being essential for the emotional, physical and social support of the child. This relationship directly influences the individual's future behavior in broader social contexts. In a complementary way, Gallahue (2013) observes that the interaction between parents and children impacts both the pace and the extent of development, reinforcing the importance of an enriched and stimulating environment for the child. The influence of the social and family environment was mentioned as a relevant factor in the motor development and balance of deaf children. However, this study did not include a systematic evaluation of these aspects, nor did it implement specific controls for these variables. Despite this, it is recognized that family support and the quality of social interactions can significantly impact children's response to the interventions carried out.

The absence of direct control over these factors limits the possibility of attributing the observed results exclusively to the dance intervention. Previous studies, such as those by Negrelli and Marcon (2006) and Gallahue (2013), highlight that families that offer greater motor and cognitive stimulation can positively influence the development of motor skills, including balance. Thus, it would be pertinent for future research to include specific instruments to assess the social and family environment, such as standardized questionnaires or qualitative interviews with caregivers. These tools could help in a deeper understanding of the impact of these variables on children's motor development.

Although it was not the main focus of this study, the inclusion of such variables in future studies will provide a more comprehensive view of the factors that affect balance in deaf children. This will also contribute to the refinement of interventions, allowing bodily practices to be adapted more effectively to the individual needs of each child. Thus, the importance of interdisciplinary approaches that integrate physical, social and emotional aspects in the planning and execution of rehabilitation programs is reinforced.

These elements point to the relevance of bodily practices in the global development of children, especially those with sensory impairment. Through movement, they have the opportunity to discover the world around them and themselves, something that occurs spontaneously in children without pathologies, but which may require specific interventions for those with limitations such as deafness or other sensory and neurological deficits (Santana; Wolf; Dos Santo Silva, 2021). In addition, the motor experience mediated by practices such as dance is an essential tool for the physical, emotional, and social development of these individuals.

Despite the advances observed, some limitations were evidenced. Understanding the test instructions was a major obstacle, as communication with the hearing impaired presents significant challenges, as discussed by Da Silva, Severo, and Gesser (2014). Even with the support of a Libras interpreter, some participants did not have sufficient fluency in sign language or Portuguese, which made it difficult to fully understand the proposed tasks. These barriers highlight the need for methods that are more adapted to the particularities of this population.

Finally, the gaps identified in the literature on specific balance assessment protocols for deaf children reinforce the urgency of developing and validating instruments that consider their motor and sensory needs. Such tools can contribute to a more accurate diagnosis and more effective interventions, promoting a positive impact on motor development and quality of life in this population.

These results reaffirm the importance of planned bodily interventions, such as dance, and highlight the need for an interdisciplinary effort among physical education, speech therapy, and psychology professionals to maximize the benefits of these practices in children with hearing impairments. In addition, it is essential to develop specific tests and protocols that consider the motor and sensory particularities of this population, contributing to more effective interventions and more accurate diagnoses.

CONCLUSION

The results of this study showed significant improvements in the balance of deaf children and adolescents after interventions based on dance classes. These findings reinforce the potential of dance as an effective tool for motor development, especially in improving balance, highlighting its practical applicability in the context of children with hearing impairment.

Although the results are promising, this study also points to the need for further study on the subject, especially with regard to the creation and validation of specific balance assessment protocols for the hearing impaired population. The absence of standardized instruments that consider the sensory and motor particularities of this population limits the diagnostic accuracy and efficacy of future interventions.

Therefore, it is essential that new research be carried out, with expanded samples and interdisciplinary approaches, to consolidate the benefits of body practices such as dance. In addition, it is imperative to develop more inclusive and adapted methodologies, capable of meeting the individual needs of this population and promoting a positive impact on their quality of life and overall development.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest related to this study.

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