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Academic Achievement among Students with Pre and Post-Lingual Hearing Impairment: Capturing Perceptions of Special Education Teachers

Syed Kamran Ali Razi[1] Aqsa Mehsood[2] Nabila Malik[3]

Correspondence:
aqsamehsood@gmail.com

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Affiliations

[1] Lecturer (Hearing Impairment), Department of Special Education, Punjab, Pakistan

https://orcid.org/0009-0006-0831-6095

[2] Researcher, Govt. Training College for Teachers of the Deaf, Lahore, Department of Special Education, Punjab, Pakistan

https://orcid.org/0009-0006-4601-6405

[3] Speech Therapist, Department of Special Education, Punjab, Pakistan

https://orcid.org/0009-0008-8828-3653

Abstract

Students with pre-lingual hearing impairment often face challenges in academic performance. In case of pre and post-lingual hearing impairment (HI), there are varied factors which can result in a prominent difference in their academic achievements. For this purpose, a study was conducted to compare the academic achievements of students with pre and post-lingual HI along with factors affecting their academic achievements in the perception of teachers dealing those students in the same classroom. This research is Qualitative in nature. Data was collected from six special education teachers through interview based questionnaire (open ended), who have taught both students with pre and post-lingual HI in the same classroom. The teachers were selected through purposive sampling from two deaf schools (Hamza & Inayat Foundation) in Lahore. Self-developed open-ended questionnaire was used to collect data. For analyzing the data, content analysis and coding techniques were used. The results demonstrated the teachers' perception that students with post-lingual HI used to learn more quickly and usually achieve high grades than their peers with pre-lingual HI. Additionally, the factors affecting the academic achievements in these groups are language acquisition, hearing aid use, residual hearing, parental unawareness/non-cooperative behavior and improper teaching styles & aids (poor curriculum design).

Keywords: Academic Achievements, Pre-lingual Hearing Impairment, Post-lingual Hearing Impairment.

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Introduction

The impact of hearing impairment on children's academic achievements is a subject of significance. Hearing impairment is a pervasive sensory disability that has far-reaching implications for an individual's life, particularly in the realm of education. The aim of this study was to do a comparison of the academic achievements of students with pre-lingual hearing impairment and post-lingual hearing impairment and to check the factors affecting their academic achievements. Students with hearing impairment either pre-lingual or post-lingual, often face numerous difficulties in their educational settings, comprehension of knowledge and academic outcomes. This study explored how much language development benefits post-lingual hearing-impaired students in academic achievements than pre-lingual hearing-impaired students. To comprehend this case study, it is essential to delineate hearing impairment.

Hearing impairment (HI) is defined by the Individuals with Disabilities Education Act of 2004 (34 C.F.R. § 300.8(c)(5), 2006, p. 46756) as "an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance" (IDEA, 2004, p. 46756). Hearing impairment can be classified into two categories depending on the language acquisition; pre-lingual and post-lingual hearing impairment, which was critical in this study. Satterfield et al. (2020) defined Prelingual hearing loss or impairment "as hearing loss that occurs before the development of speech and language skills, typically before 2 years of age, and can be congenital or have delayed onset." Daramola et al. (2019, p. 1491) defines "post-lingual hearing loss occurs after spoken language has been procured, having developed speech before supporting hearing loss can utilize speech along these lines for learning and social purposes." This distinction introduces two distinct groups with varying linguistic foundations and communicative experiences. Understanding the timing of hearing impairment onset is crucial because it significantly influences language acquisition, communication abilities, and academic achievement. This is because, hearing loss can affect speech and language development, especially when it occurs early in a child's life.

While doing a study on the academic achievements of students with pre and post-lingual hearing impairment, it was important to state 'special education' in which both discussed types of students were provided with specially designed instructions to bring effectiveness in their academic achievements. In the Individuals with Disabilities Education Act (IDEA), special education is defined as the "instruction that is designed specifically to respond to the learning needs of an individual with disabilities regardless of environment, whether in a classroom, home, or hospital."

Since this research examined elements influencing the academic performance of students with pre- and post-lingual hearing impairment, it is necessary to clearly define some of these factors. Wikipedia defines "a teaching method as a collection of principles and techniques employed by educators to facilitate student learning." Merriam Webster (2019) describes a Teaching aid as "An item (like a book, image, or map) or tool (such as a DVD or computer) utilized by an educator to improve or invigorate classroom teaching." The (RCSLT) Royal College of Speech and Language Therapists (2019) stated that "Speech and language therapy offers treatment, assistance, and care for both children and adults who experience challenges with communication, as well as with eating, drinking, and swallowing." The (NIDCD) National Institute on Deafness and Other Communication Disorders (2022) remarked cochlear implant as a compact, intricate electronic device, helps in giving a sound's sensation to someone with profound deafness or severe hearing impairment. The device comprises an external component located behind the ear and another part that is surgically implanted beneath the skin. National Institute on Deafness and Communication Disorders (NIDCD) defines hearing aids as small electronic devices fixed in or behind the ear helps in making some sounds amplified so that people with hearing impairment can hear, communicate, and participate more actively in

daily living activities. They can assist people in hearing both quiet and noisy environments.

The hearing loss after language development can bring many changes in their academic achievements when they have to join special education classroom after leaving general education setting. Adjusting in a Special Education environment for post-linguals with their pre-lingual HI peers might be challenging at first but can prove helpful in maintaining their academic achievements. This paper addresses the significant differences between the academic achievements of both students with pre and post-lingual HI by determining the factors affecting their academic achievements in relation to their learned auditory and spoken language skills. This study can provide a crucial point for understanding the strengths and weaknesses resulting in their overall varied academic performances. The perceptions of special education teachers can help in determining the class participation and learning strength of each individual for further exploration of innovative instructional strategies, techniques and tools.

Literature Review

While there was existed study on the academic achievements of students with hearing impairment, there was a gap in the literature concerning the comparative analysis of pre and post-lingual hearing impairment. This study tried to fill that gap and contribute valuable insights to the field.

A comparative analysis was conducted on the academic performance of students with congenital deafness (deafness present at birth) versus those with acquired deafness (deafness that develops after birth) at a college in Nigeria. Ogundiran et al. (2013) studied fifty students with hearing impairments, comprising 25 with congenital deafness and 25 with acquired deafness, all at the same educational level in the Nigerian College. To assess the academic performance in English and Mathematics, a teacher-made achievement test was utilized. The results of this study indicated that there was no significant difference in the academic achievement of students with congenital and acquired deafness in both English and Mathematics. Since this study did not determine whether or not the students with acquired deafness were post-lingual, we felt compelled to compare their academic performance as well.

In their study, Kanwal et al. (2024) examined the academic performance of students with hearing impairments, with a focus on analyzing math, English, and Urdu problems. The majority of students received below-average reading, writing, and numeracy scores, according to the results. There was a notable gender disparity in the Urdu Written Test. Furthermore, other demographic factors did not show any discernible variations. According to Daramola et al. (2019, p. 1491), "people with postlingual hearing loss typically have improved learning resources and are better resourced than people with prelingual hearing loss." (p. 1491). Further stated that "post-lingual hearing-impaired students are significantly higher in creativity level than their pre-lingual peers." (p. 1491)

Daramola et al. (2019) noted that individuals who have developed speech prior to experiencing hearing loss can use their speech capabilities for learning and social interactions. Experiencing hearing loss at an early stage (either before birth or before one has developed speech) poses greater challenges than losing hearing later in life, particularly after speech has been acquired and identity is formed. The effects of early life hearing loss are evident in the overall personality of the affected individual. Individuals with pre-lingual hearing impairments have limited opportunities to engage effectively in educational or social environments. Additionally, Salmani-Nodoushan (2008, pp. 16-17) noted regarding the language and literacy growth in children who are pre-lingually deaf that "if their peers learn sign language, and if educators instruct them in sign language, it will enhance the chances for social interaction among deaf students, thereby impacting their academic outcomes." (p. 16). He further emphasized by mentioning the words of Moores (2001) that "Many children in this demographic remain

deprived of language until they start school, which is likely their first encounter with a competent and natural language model." (p. 17).

Kauffman (2003) suggested that individuals with post-lingual hearing loss tend to demonstrate greater creativity than those with pre-lingual hearing loss because the former possess enhanced learning resources and outputs due to the communication skills acquired prior to experiencing hearing loss. Similarly, Olanrewaju (2014) noted that there is a significant difference in the problem-solving abilities of students with hearing impairments, with post-lingual individuals showing marked improvement in problem-solving compared to their pre-lingual peers. Likewise, Ademokoya (2007) argued that students with post-lingual hearing loss excelled beyond their pre-lingual hearing-impaired counterparts. (Daramola et al. 2019)

The performance of children with pre and post-lingual hearing impairment (HI) was assessed in one of the studies conducted by LF Tanamati et al. (2012), in which findings revealed that children with peri and post-lingual HI were having the highest performance levels, advanced auditory abilities and speech production as compared to their peers with pre-lingual HI.

From the study of Free et al. (2011) and Myers et al. (2010), it is found that provision of early access to language can significantly overcome the challenges related to literacy and also fill the gaps of literacy skills found in children with deafness or HI. This shows that early language exposure is how much crucial for improved academic performance. A study by Tyler et al. (2000) revealed that the adults with post lingual deafness (who had lost hearing capability after hearing speech for several years), holds a memory of how speech actually sound. By utilizing their advanced language skills, these individuals interpret the sentence context and try to correlate words with stimuli. Undoubtedly, the initial months of using CI resulting in the progress of majority of individuals. Opposite to this, children with Prelingual deafness which are typically having minimal or no amount of exposure to speech, having a limited memory of speech sounds. Due to their limited auditory exposure and language acquisition, they find it difficult to use sentence context.

MacDonald (2007) in one of the research studies focused on the secondary students with deafness in New Brunswick and Nova Scotia by assessing their academic achievements. Findings showed that there was a notable discrepancy between the outcomes of assessment done by class teachers and a standardized achievement test. This revealed that there might be some additional elements which teachers take into account for grading students with academic success beyond only academic achievement. MacDonald (2007) carried out a study focusing on the assessment of academic achievement among secondary students who are deaf in New Brunswick and Nova Scotia. The findings of this research highlight a notable disparity between the grades assigned by classroom teachers and the outcomes of a standardized achievement test. This suggests that teachers might be taking into account additional factors beyond mere academic performance when determining grades that signify academic success.

Choudhry et al. (2021) stated, various factors can contribute to significantly impact the academic achievements of individuals with hearing impairment (HI). These factors can often intervene with each other to isolate their individual impacts, can cause positive or negative results for the student. For example, the severity of hearing loss, which affects receptive, expressive, and oral communication skills, plays a crucial role in classroom interactions. Additionally, the level of parental involvement, which may stem from limited resources and high expectations for the child, can create pressure that negatively impacts academic performance and leads to variability in achievement.

Assistive listening devices, including hearing aids and cochlear implants, can significantly benefit hearing impaired students; however, the extent of this benefit is impacted by several factors. These factors or elements include the severity of hearing

loss, age of onset, age of utilizing hearing aid first time or the age at which the cochlear implantation was occurred, as well as the duration or length of time the device or implant has been in use. C.-M. Wu and colleagues (2013) stated about the contribution in which Damen et al. employed the SIFTER (The Screening Instrument for Targeting Educational Risk) questionnaire on students with cochlear implants to evaluate the academic performance, revealing that these students scored significantly lower than their hearing peers across various domains or areas, including academics, attention, communication, class participation, and school behavior. Findings indicated both the age at implantation and the duration of implant use contributed to these results.

Jaiswal et al. (2023) highlighted in their study that students who are post-lingually deaf have an existing language foundation, suggesting that early cochlear implantation or the use of hearing aids can significantly improve their ability to process auditory information. The resulted improvement may lead to make them more comparable to their hearing peers due to their achieved academic success. While Mantokoudis et al. (2011) described, adolescents with prelingual deafness are may not acquire speech perception so they are generally considered to be not eligible for late cochlear implantation (CI). Moreover, performance of adults with pre-lingual hearing impairment is found worse overall than those with post-lingual hearing impairment. As a result, these individuals are classified as borderline candidates and are often not recommended with CI by many CI centers.

Sugaya et al. (2015) mentioned in study for fostering age-appropriate speech acquisition and language development in hearing-impaired children by focusing the significance of early auditory diagnosis and intervention. The study compared the audiological and language test scores with demographic variables among children with pre-lingual hearing impairment ranging from severe to profound. The study focused on determining the predictive factors helpful in influencing language acquisition by doing a comparison of hearing and language test scores along with demographic variables among children with severe to profound pre-lingual hearing loss having cochlear implants (CI). Categories of these children were made, based on the age of utilizing hearing aids (HAs) for the first time and their participation in Newborn Hearing Screening (NHS). Findings revealed of improved language perception and academic achievements in children with pre-lingual HI due to early usage of HAs prior to cochlear implantation. Moreover, the paper marked the significance of long-term follow up to assess the impactful procedure of NHS in promoting language acquisition.

Those who were with hearing impairment at birth or during early childhood, now having cochlear implants when turned adults can show notably poorer results. Those who were prelingually deaf, may have prolonged unilateral sound deprivation which seems to adversely affect the cochlear implantation. Whereas, the same negative effect does not exhibit by children with postlingual deafness. This shows of how auditory deprivation experienced in the initial years of life impacts development differently than deprivation occurring after advanced hearing and language acquisition. Such findings align with research, marking a crucial period for the auditory skills development and spoken language from birth to approximately four years of age.

Carvalho et al. (2020) mentioned one of the study in which Hinderink et al. conducted a comparative research involving 19 adult patients, both prelingual and postlingual with cochlear implantation. Through discrimination tests, they determined that postlingual patients exhibited higher performance in closed-set tasks and auditory perception assessments compared to their prelingual counterparts. Consistency of such findings is found with existing literature. In a related study, L. Diaz et al. (2019) stated the link of academic achievements which are found to be delayed with the early childhood deafness, continue to affect many children with CI. Highlighting the several key points including: firstly, language acquisition in

prelingually deaf children, their academic achievements and experience of educational environment can be predicted by the age of cochlear implantation. Secondly, a positive correlation found in numerous studies between language abilities and the skills to integrate into mainstream education, as well as with reading and literacy proficiency. Thirdly, speech intelligibility enhanced in deaf children by cochlear implants. Lastly, there is some sort of a vital role plays in the academic achievements of children by the socio-educational status of parents.

A research study led by A. Sugaya and colleagues (2019), focused on the demographic features and language acquisition of Japanese children having hearing impairments and associated writing and reading difficulties. The paper marked the importance of writing and reading skills for these children, as such skills are considered to be crucial for improving their language skills. However, it mentioned the extent of writing and reading challenges and their effect on various elements of language acquisition remain unclear. Writing and reading are crucial for the language development of hearing impaired children, specifically in relation to their academic performance during the middle level of education. Moreover, researchers prioritize the need of screening for writing and reading problems to facilitate timely interventions and to reduce potential delays in language and academic achievements among hearing impaired children.

Kanwal et al. (2024) mentioned numerous studies indicating that deaf children shows significantly lower performance in reading comprehension, literacy skills, and overall educational achievement compared to their hearing peers, as a result which reduces their chance of enrollment in postsecondary level of education (Garberoglio et al., 2014; Mitchell & Qi, 2012). Following completion of primary special education, researcher assessed academic achievement of students with hearing impairment (SWHIs). Findings revealed of substantial ratio of the participants scored below average in basic skills. Results showed alignment with the earlier studies of Mitchell and Qi (2012), deaf students usually perform below than their hearing peers in academic assessment.

Kanwal et al. (2024) noted early identification and intervention, typically occurs through the use of hearing devices and sign language (Ching et al., 2017; Ganek et al., 2012; Ruben, 2017), can enhance language abilities and literacy in children with deafness. Being literate is crucial for both academic and professional achievementssuccess. Early exposure to formal schooling, social interactions, and leisure activities all facilitates in developing reading and writing skills (Lederberg et al., 2013; Luckner et al., 2005). Moats (2000) stated the lack of these abilities can result in social maladjustment, job search difficulties, and academic failure.

Kanwal and Bashir (2022) studied students enrolled in special education institutions predominantly are taught through conventional methods, including lectures and transcribing information from whiteboards or textbooks. Understanding and involvement could be impeding by using traditional methodology which may not properly address or meet their distinct learning requirements. The limited incorporation of audio-visual aids restricts students' opportunities for visual and auditory learning experiences, which are crucial for hearing impaired individuals in enhancing their grasp of concepts.

Borders et al. (2018) mentioned technological devices including hearing aids and cochlear implants can sometimes reduce the lack of sound and support both sound awareness and speech production; thus, there are examples when the use of such assistive technology may not be beneficial for various reasons. Additionally, it is crucial to recognize that hearing loss impacts each individual differently due to a range of elements or factors.

Thomas (2022) defined assistive technology (AT) asan impactful way to help HI children communicate fully in inclusive education settings. Explains the self-motivated advantages and reasons why children with HI should use AT. The study demonstrates that inclusive education (IE) and

assistive technology (AT) offer helpful suggestions to teachers who want to use AT more effectively in IE. Furthermore, assistive technology (AT) encompasses related services and products that advance the work with children with HI.

Muluneh and Bejji (2024) school-related stress has a significant negative correlation with academic achievement and a positive correlation with behavioral issues. Conversely, psychological capital was found to have a significant positive relationship with academic success and a negative relationship with behavioral problems. Notably, higher levels of psychological capital played a significant moderating role in the interactions between school-related stress and both academic achievement and behavioral issues. Factors such as health concerns, reading habits, unrealistic expectations, and insufficient parental involvement adversely affect academic performance. Additionally, institutional challenges, including ineffective teaching strategies, lack of adequate resources, and inflexible curricula, further impede the academic success of students in higher education institutions.

Gupta (2022) reported in the results of a study that nearly all students within the sample exhibited cognitive abilities ranging from below average to average. The performance patterns suggested that a student who scored below average in one cognitive area was likely to have below-average scores in other cognitive domains as well. The findings imply that interventions ought to be tailored to meet the specific needs of each student's individual profile.

These all studies clearly facilitate that the students with post-lingual HI have already some sort of language experience so, after getting assistive devices & other beneficial factors, the chances of getting better grades increase for them. As language has the core role in learning academic subjects. These all previously mentioned studies also contributing to this research by clearly presented the factors affecting their academic achievements.

The main objective is to review the factors leading to create a difference of academic achievements between students with pre and post-lingual HI available in literature. Also aiming towards identifying the factors influencing academic achievements of these students. The review provided this study with a detailed analysis of how age of auditory and language acquisition along with age and duration of using assistive devices impacts the academic success of individuals, notably highlighting the writing, reading and creative domains. Additionally, focuses to provide more attention to the areas which can be assisted to provide all the individuals with effective instructions using advanced teaching strategies and aids.

Research Questions

i. What are the academic achievements of students with post-lingual hearing impairment as compared to those of students with pre-lingual hearing impairment?
ii. What are the factors affecting the academic achievements of students with pre and post-lingual hearing impairment?

Methodology

Qualitative case study research design was used to capture perceptions of teachers regarding the academic achievement of students with pre and post-lingual hearing impairment. A self-developed open ended questionnaire was employed to collect data from 6 teachers. The collected data was analyzed by a content analysis method and coding technique at the end.

The population of this study was consisted of all the special education teachers who have taught both students with pre-lingual hearing impairment and post-lingual hearing impairment in the same classroom of any grade or class level including primary, middle, secondary and high levels. The intention was to conduct or collect the varied experience or perceptions of special education teachers from the varied levels of education with their pre and post-lingual hearing impaired students.

A sample of the study were the six Special Education teachers from the two prestigious special

education institutions for deaf in Lahore, Pakistan ("Inayat Foundation Academy for Deaf" & "Hamza Foundation Academy for the Deaf") who have taught both the students with pre lingual hearing impairment and post-lingual hearing impairment in the same classroom & have valuable perceptions or experience about dealing with these students & their academic achievements. The purposive sampling technique was used in this study.

Instrument or Research tool

In order to compare the academic achievements of students with pre-lingual hearing impairment and post-lingual hearing impairment; including to investigate the factors affecting their academic achievement, it was necessary to make a self-made instrument. For this purpose, the instrument was developed after studying the literature review related to the study under the supervision of research supervisor, special educationists & other related professionals. The Open ended questionnaire was developed as an instrument for data collection, consisted of 13 questions covering the broad objectives of this study.

Validity of the Instrument

After the tool "open-ended questionnaire" was developed, it was discussed with the research supervisor, special educationists and other related professionals who were dealing with the students with hearing impairment (psychologists, speech therapists, & teachers). These specialists were asked to rate each and every item of the test on the following criteria:

1) Relevance
2) Clearance
3) Simplicity
4) Ambiguity

Data Collection and Analysis

The data was collected by distributing open-ended questionnaires among the teachers of two special education institutions (Hamza Foundation & Inayat Foundation Academy for the Deaf) in order to answer the open-ended questionnaires for proceeding the Qualitative type of research, in which the 6 respondents (required special education teachers) gave all the answers to 13 questions. The data was collected through proper channel and permissions or consents.

The data was analyzed by using Content Analysis Method and Coding Technique in order to justify the research questions and fulfill the objectives. A systematic analysis of a text was done to identify patterns and themes in data for concluding the study or presenting the results. Content analysis was used to determine the presence of certain words, themes, or concepts within some given qualitative data (i.e. text). A Coding technique was used to convert raw data into a standardized format by assigning codes, words, or phrases.

Results

Each question in this open-ended questionnaire represented a specific theme. Theme # 1 represents the question # 1 from the questionnaire. Here the most common & repetitive responses from the responders are shown as a result to each theme in the form of table.

Theme 1	Result
Presence of Required Students	Yes, both types of students are present. Most of the students with pre-lingual hearing impairment usually took admissions in Kindergarten and post-linguals from middle level (Class 5th).

Table 1: 100% teachers responded with the same answer that they have both students with pre and post-lingual HI in their classrooms in which all said that most of the students with Pre-lingual HI in their classrooms got admissions from the beginning of classes (kindergarten) while 66.67% said that most students with post-lingual HI usually got admissions from the middle level (usually from 5th class)

Theme 2	Result
Level of Hearing Impairment	Students with Pre-lingual hearing impairment are with varied hearing loss levels and students with post-lingual hearing impairment are with mild-moderate hearing loss.

Table 2: 66.6% teachers said that students with Pre-lingual HI have varied (Mild-Profound) hearing loss levels while talking about students with post-lingual HI, 66.6% said that students with post-lingual HI are mostly with Mild-Moderate levels of HL in their classroom.

Theme 3	Result
Reception of any early services or therapy	Most of the students with pre-lingual hearing impairment have received Speech therapy but proved effective for few. While few post-linguals have received speech therapy but proved effective for all of them.

Table 3: 50% teachers said that both type of students received Speech & Language Therapy which is quiet effective for students with mild HL and for students with post-lingual HI in their classroom. While 50% said that only pre-linguals have received SLT in which 33.3% agreed upon its effectiveness. In addition, none of the teacher reported about the reception of early intervention services by the students of any group.

Theme 4	Result
Usage & effectiveness of assistive devices	Hearing aids equally used by both types of students but found effective for most post-linguals with mild HL.

Table 4: 66.67% teachers said that both the students with pre & post-lingual HI use hearing aids and all are agreed on the effectiveness of hearing aids (HA) on the academic achievements of students with post-lingual HI as compared to students with pre-lingual HI. While 33.3% said that students with pre-lingual HI uses no HA and CI.

Theme 5	Result
Attendees of Tuition or Extra classes	Tuitions are mostly attended by students with Pre-lingual hearing impairment.

Table 5: 66.67% teachers said that the tuition and extra class attendees are mostly students with pre-lingual hearing impairment.

Theme 6	Result
Participation in Classroom activities	Usually both of the students with pre and post-lingual HI participate but sometimes hesitancy & shyness is seen in students with post-lingual HI for being part of special schools after general schools.

Table 6: 50% teachers said that both type of students equally participates while 33.3% said that students with post-lingual HI participate more than the students with pre-lingual HI when being assess by the teacher individually in the classroom. While the reason behind students with post-lingual HI's low participation in most of the situations is hesitancy and shyness of being part of the special school after coming from general school.

Theme 7	Result
Learning speed or potential of students	Most of the students with post-lingual HI usually learns quickly

Table 7: 83.33% teachers said that students with post-lingual HI used to learn more quickly than their pre-lingual HI peers. While 16.67% said that all students learn in the same pace.

Theme 8	Result
Highest Grade Achievers	Students with Post-lingual hearing impairment usually achieve higher grades such as A & A+ while students with pre-lingual HI usually achieve Grade B & C.

Table 8: 100% of the high achievers are students with post-lingual HI in the classroom, they usually achieve Grade A+ & A, while 66.67% said that students with pre-lingual HI usually achieve Grade B and C.

Theme 9	Result
Weaker subjects(areas) of Students	Most of the students with pre-lingual HI usually feel difficulty in Language, Maths & Science subjects while most of the students with post-lingual HI have no difficulty in any subject area.

Table 9: 66.67% said that the students with pre-lingual HI usually feel difficulty in Language and students with post-lingual HI have no difficulty in any subject whereas 33.33% said that students with post-lingual HI sometimes feel difficulty in conceptual subjects. 50% also said that students with pre-lingual HI are usually weak in Maths & Science.

Theme 10	Result
Use of Teaching techniques	Usually same teaching techniques for both types of students are used.

Table 10: Usually 100% teachers use same teaching techniques for both groups in which 33.33% sometimes use demonstration method for the clarification of some specific topics especially for the students with pre-lingual hearing impairment.

Theme 11	Result
Effectiveness of teaching aids	Usually quite & same effective for both types of students.

Table 11: 100% teachers' perceptions is that teaching aids are quite effective in teaching both types of students and 66.67% of the teachers do planning before using the teaching aids in classroom & considering students' needs and abilities.

Theme 12	Result
Role of Educational environment or sitting arrangement	Equally effective for both types of students that's why they equally prefer to sit on the seats according to their needs and hearing abilities.

Table 12: 100% teachers have a same perception that educational environment or sitting arrangement plays an equally effective role in the academic achievements of both groups (students with pre and post-lingual hearing impairment) that's why they equally prefer to sit on the seats according to their needs and hearing abilities.

Theme 13	Result
Overall factors affecting their learning	Parental unawareness/non-cooperative behavior and improper teaching styles & aids (poor curriculum)

Table 13: 66.67% teachers have common perceptions that parental unawareness/non-cooperative behavior and improper teaching styles & aids (poor curriculum design) can contribute to weakness in learning of any subject in these 2 groups.

Discussion

While comparing the academic achievements of students with pre and post-lingual hearing impairment, there was a significant difference found in the academic achievements between students with pre and post-lingual HI. The students with Post-lingual HI were usually found as Grade A and A+ achievers as compared to students with Pre-lingual HI, who were usually found achieving Grade B and C as per the teacher's reported perceptions about these students. Whereas, in the study of Ogundiran et al. (2013) there was no significant difference found in the academic achievement of students with congenital and acquired deafness in both English and

Mathematics. Still, it mentions that somehow the difference was found which was specifically tested in the subjects of English and Mathematics. But it's difficult to determine whether or not the students with acquired deafness were post-lingual, and whether there was difficulty in subjects other than English and Mathematics. Overall, the study of Ogundiran et al. (2013) initiates path towards this research study to explore the academic achievements of students in relation to the differences in their language acquisition.

Similarly, the study of Kanwal et al. (2024) also strengthens the previously discussed points that the problems in academic performance of students with hearing impairment are largely found in the area of reading, writing (related to language subjects) and numeracy (related to Maths). These are the same problematic areas (Language & Maths) which can be seen in the results of this study, while comparing the academic achievement of students with pre and post-lingual HI. Moreover, the importance to overcome the problems of Language related subjects for students with Pre-lingual HI was also supported from the studies of Sugaya et al. (2019) and Kanwal et al. (2024) in which it is emphasized to "develop the reading, writing & overall language skills in children with HI to especially excel them academically."

While the results obtained for factors affecting the academic achievements of students with pre and post-lingual HI are significantly similar to the factors mentioned in the study of Choudhry et al. (2021) & Mumba et al. (2022), in which family involvement, insufficient resources, clouded school curriculum, inappropriate instructional methodologies, etc. were mentioned. Additionally, academic benefits to the students with post-lingual HI found in this study can be justified by the study of Jaiswal et al. (2023) in which it is indicated that "post-lingually deaf students possess a prior language foundation, which means that early cochlear implantation or the use of hearing aids can enhance their capacity to utilize auditory input."

As this study also shows the results in favor of assistive technology like hearing aids usually found beneficial for students with post-lingual HI, the study of Thomas F.B. (2022) also stated the importance of assistive technology (hearing aids) in the inclusive education. As both the students with pre and post-lingual HI were taught in the same classroom as an inclusive education system, that's why this statement reveals the effectiveness of hearing aid usually towards post-lingual HI who already have acquired language, equally used hearing aids but got hearing impairment later after language acquisition. Overall, this highlights that if students with post-lingual HI have already acquire language to maximum extent then they may not face problems in Language related subjects as much as students with pre-lingual HI may face.

Conclusion

Both of the students with pre & post-lingual hearing impairment equally participate in classroom activities but students with post-lingual hearing impairment usually used to learn more quickly and achieve higher grades than their peers with pre-lingual hearing impairment. Most of the students with post-lingual hearing impairment usually achieve Grade A+ and A, while their peers with pre-lingual hearing impairment usually achieve Grade B and C. While the factors affecting their academic achievements are language acquisition, hearing aid usage, residual hearing, parental unawareness/non-cooperative behavior and improper teaching styles & aids (poor curriculum design & classroom management).

Recommendations

Keeping in view the findings of this study, several recommendations emerge to:

1. Implement early intervention programs that focus on identifying hearing impairment in infants and providing timely support services.

2. Adopt inclusive teaching practices that accommodate the diverse learning needs of students with hearing impairment.
3. Foster a supportive and inclusive school environment that promotes the social and emotional well-being of students with hearing impairment.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author Contributions

Syed Kamran Ali Razi: Conceptualization (equal), Methodology (equal), Qualitative Analysis, Writing –original draft, Writing –review & editing

Aqsa Mehsood: Methodology (equal), Analysis, Writing –review & editing

Nabila Malik: Methodology (equal), Analysis, Writing –review & editing

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