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ABSTRACT

Objective This cross-sectional comparative study aimed to analyse and compare the story-grammar components in Tamil-speaking children with and without hearing impairment (HI) narratives.

Design The study used a cross-sectional, comparative design to assess and compare narrative structures.

Setting Data were collected at the Sri Ramachandra Institute of Higher Education and Research in Chennai, India.

Participants 30 children participated in the study, including 15 children with severe to profound hearing loss who used cochlear implants and 15 with normal hearing. The participants were language-age-matched children aged 3–5 years, proficient in Tamil.

Interventions No specific interventions were implemented in this study.

Main outcome measures The primary outcome measures focused on story-grammar components, including settings, characters, initiating events, internal plans, attempts, outcomes, and resolution. These components were evaluated through narrative retellings by the children.

Results Analysis of the narratives revealed significant differences between the two groups. Children with normal hearing demonstrated a higher representation of story-grammar elements than children with HI.

Conclusions The findings suggest that children with normal hearing exhibit a more proficient understanding and utilisation of story structure in their story-telling than children with HI. This study highlights the importance of narrative analysis in language assessment, particularly for children with HI. Tailored interventions incorporating appropriate language stimulation techniques are needed to enhance children's narrative skills with HI. Further research in this area is warranted.

INTRODUCTION

Several studies have examined the impact of cochlear implants on children with severe to profound hearing loss, emphasising the importance of early intervention and personalised rehabilitation approaches. For

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Participant selection is restricted to cochlear implant users with a language age of 3–6 years.
- ⇒ The scope of the study is specific to a particular age group and language level.
- ⇒ Sample size considerations may affect the scope of findings.

instance, Geers conducted a longitudinal study on children who underwent early cochlear implantation, demonstrating significant improvements in speech perception, production and language development.¹ Similarly, Rubinstein presented the advantages of cochlear implants for individuals with severe to profound hearing loss, highlighting the importance of early intervention, ongoing support and personalised rehabilitation strategies. The study emphasised enhancing speech perception, production and language abilities through cochlear implants. Moreover, the study recognised the challenges associated with paediatric cochlear implantation and underscored the need for comprehensive assessments and tailored intervention strategies to meet each child's unique needs.²

Sharma *et al* evaluated how various parameters affect the outcomes of cochlear implants in paediatric patients. The findings highlighted that the age of implantation and the duration of device use play crucial roles in determining the effects of cochlear implantation. The study revealed that early implantation and a more extended period of device use contribute to better speech perception, language development and overall functional performance. The authors emphasised the significance of auditory rehabilitation in maximising the benefits of cochlear implants. They stressed the need for consistent and

structured rehabilitation programmes to support children in optimising their hearing skills.³

Ganek *et al* investigated the language outcomes of individuals who underwent cochlear implantation. The study emphasised that cochlear implantation positively impacts language development in individuals with profound hearing loss. They identified influential factors such as age at implantation, duration of implant use, residual hearing and additional disabilities. The article also acknowledged potential challenges individuals face with cochlear implants and stressed the importance of individualised approaches to address language delays or difficulties in specific areas.⁴ Worsfold *et al* reported that children who received early confirmation of hearing impairment (HI) experienced substantial delays in their narrative skills compared with typically developing peers. Identifying and intervening early to support the development of narrative abilities is crucial.⁵

Research has shown that children with HI may encounter difficulties in organising and structuring their narratives, resulting in less cohesive and coherent story-telling.⁶ Reuterskiöld, Ibertsson and Sahlén highlighted the narrative production difficulties children with hearing loss faced, particularly regarding story structure and coherence. Assessing and providing support for the narrative abilities of children with HI is vital for enhancing their communication skills.⁷

Weiss and Johnson investigated the relationship between narrative skills and syntactical abilities in children with HI. Their study revealed that children with HI demonstrated lower levels of narrative and syntactical skills than their typically developing peers. The researchers also found a strong correlation between narrative and syntactical competencies in both groups. The authors concluded that HI has a negative impact on the development of narrative and syntactical skills in school-aged children. They stressed the significance of addressing these difficulties through educational interventions and offering appropriate support to foster language development.⁸

Yoshinago-Itano and Downey examined the structural elements of narratives in deaf children. They found that the narratives of deaf children lacked tools for generating cohesive narratives, such as conjunctions and pronouns.⁹ Although major story-grammar structures were present in the narratives of students with HI, their recall of the story's events was only about half compared with their hearing peers.¹⁰

Kirk *et al* examined the effects of age at cochlear implantation and communication mode on the narrative performance of young children. They found that earlier implantation and the use of spoken language were associated with improved narrative structure and cohesion performance. The study highlights the importance of considering the mode of communication, as children using spoken language exhibited different narrative patterns than those using sign language.¹¹

Soares *et al* found that children with HI have lower levels of narrative competence. This results from difficulties

in organising and structuring their narratives, resulting in less cohesive story-telling. The study emphasises the significance of resolving and bolstering narrative skills in children with HI to improve their communication skills.⁵ Reuterskiöld *et al* examined the narrative skills of children with HI, exploring their abilities beyond the sentence level. The findings indicate that children with hearing loss face challenges in narrative production, particularly in story structure and coherence. The study emphasises the importance of assessing and supporting narrative abilities in children with hearing loss.⁷

Amemiya *et al* compared nouns and verbs in the oral narratives of children with HI and typically developing children with normal hearing. The findings revealed that children with HI demonstrated a lower frequency of nouns and verbs than their peers with normal hearing and that children with normal hearing used a wider variety of verbs in their narratives. This study highlights the importance of considering these specific linguistic components when assessing and supporting the language development of children with HI. It also underscores the need for targeted interventions to support expressive language skills in individuals with HI.¹²

Griffith and Ripich conducted a study comparing the ability of children with hearing loss and learning disabilities to recall story structures with that of non-disabled children. The findings indicated that while children with hearing loss and learning disabilities faced challenges in organising and remembering the overall story structure, their comprehension of individual story elements was similar to that of non-disabled children. These results suggest that interventions that improve story structure recall benefit these children and enhance their narrative comprehension abilities.¹³

Language interventions and targeted support have proven effective in enhancing narrative abilities in children with language disorders and HI. Interventions involving repeated retellings of model narratives and the creation of personal narratives have shown immediate positive effects on language characteristics.¹⁴ Understanding the relationship between narrative and syntactic competencies informs intervention strategies to promote language development in children with HI.⁸ Previous studies have reported on story-grammar-enhanced narrative interventions for children with HI, suggesting their effectiveness in facilitating the acquisition of narrative skills.^{15–17}

Narratives of children with HI in the Tamil-speaking context

Research on narratives in Tamil-speaking children has primarily focused on typically developing children. Two notable studies by Priyadarshini and Venkatraman & Thiruvalluvan have examined story-grammar development in preschool and school-aged children, using different story stimuli and contexts. Venkatraman and Thiruvalluvan studied the developmental progression of story-grammar components in typically developing Tamil-speaking children aged 3–6 years and 11 months.^{18 19} The

results revealed a developmental trajectory in acquiring and expressing story-grammar components, with the character element being the most frequently described. There was an increase in these elements initiating events, internal plans, attempts and outcome elements as age increased. The resolution element also exhibited a gradual increase over time. These findings provide normative data for assessing narrative abilities in the Tamil-speaking population and offer valuable insights for designing interventions targeting children with language disorders.²⁰

Abinayaa *et al* implemented the Multilingual Assessment Instrument for Narratives in Tamil to study story-grammar analysis in children. The process entailed the alteration of English sentences to adopt more superficial structures that would facilitate the natural formation of sentences in Tamil. Furthermore, the order of events in the sentences was modified accordingly. The bilingual population proficient in Tamil and English often borrows words from one language to convey negative emotions. The study aimed to assess the narrative proficiency of children aged 5–8 years using a modified assessment tool.²¹

Priyadarshini examined the development of story-grammar in Tamil-speaking children aged 5–8 years by analysing their retold narratives using videos without narration. The story ‘Frog, where are you?’ elicited the narratives. Different age groups were compared, and the performance varied across age groups. The study explored story-grammar elements such as characters, settings, goals or problems, episodes, and resolution. Findings showed that older children expressed story-grammar units more frequently. However, limited research exists on the narratives of children with HI.²² A study by Maria *et al* compared narratives’ microstructures and macrostructures in children with and without HI aged 4–8 years. The study employed a picture description task and found significant differences between the two groups’ narrative macrostructure and microstructure parameters. Jayaseelan *et al* reported challenges in several macrostructural domains for children with HI, including topic maintenance, event sequencing and explicitness. Children with HI faced difficulty maintaining narrative coherence, organising events logically and providing a clear resolution to the story. Additionally, they exhibited deficits in explicitness, informativeness, elaboration and completeness in their narratives. The study concluded that early intervention strategies should target narrative coherence, event organisation and explicitness, including informativeness, elaboration and completeness.²³

However, a methodological gap existed as the study used a one-time picture description context, which may not fully capture the complexities of narrative tasks such as story retelling or personal narratives. The current study examines the story-grammar components of narratives in Tamil-speaking child cochlear implant users, intending to fill the methodological voids in this area. Through a specific focus on this particular subgroup, the study can conduct a more precise examination of their narrative capabilities. Given the existing research on narrative development in typically developing children and the observed differences in narratives of children with HI, there is a clear need to conduct a study explicitly focusing on story-grammar analysis in children with HI. Such a study can provide insights into these children’s challenges and difficulties in constructing narratives. The knowledge gained can inform targeted intervention strategies to improve narrative skills and promote overall language development in this population.

METHOD

Patient and public involvement

The children with hearing loss who participated in the study underwent cochlear implant surgery and received aural rehabilitation services at the Sri Ramachandra Faculty of Audiology and Speech-Language Pathology. The parents of the recruited children completed a consent form compiled in Tamil and English outlining the study’s purpose, data collection procedures, data confidentiality, and the scientific use of the acquired data.

Participants

The research involved the enrolment of 30 children, who were subsequently segregated into two distinct groups. The initial cohort consisted of 15 children diagnosed with severe to profound HI and receiving cochlear implants. The second group included 15 children with normal hearing. [Table 1](#) provides demographic information for the participants. A groupwise comparison was made by recruiting five children representing both groups within three specific language-age groups: 3 years to 3 years and 11 months old, 4 years to 4 years and 11 months old, and 5 years to 5 years and 11 months old. This division was carried out to maintain equal representation within each language-age group.

The inclusion and exclusion criteria for children with normal hearing were as follows: children whose native language and primary mode of communication is Tamil,

Table 1 Participants’ description for narrative comparison

Groups	Number of participants (M/F)	Mean age	Mean language level	Duration of rehabilitation	Age of implantation
Normal hearing children	15 (7/8)	4.5	4.5	–	–
Children with hearing impairment	15 (7/8)	9.4	4.3	4.2	2.4

without any risk of hearing loss or history of middle ear infections, who completed an informal hearing test, and who had no history of late speech onset or speech and language delay milestones. For children with HI, the inclusion and exclusion criteria were as follows: children diagnosed with prelingual deafness before the age of 3 years and who received cochlear implants to improve their hearing, with their native language and primary mode of communication being Tamil; language assessment using the Assessment of Language Development indicating a language age above the receptive and expressive language age, ranging from 3 years to 5 years; and exclusion of children with HI and multiple disabilities from the study.

Materials and stimulus

The study used a story titled 'My Fish, No Fish', which had been translated into Tamil. The story was obtained from storyweaver.org.in, a digital story repository. Before the study, the story underwent a pilot test for familiarity among Tamil-speaking children between the ages of 3 years and 6 years, as conducted in the study by Venkatraman and Thiruvalluvan.²⁰

Procedure

Before retelling a story, the researcher established a rapport with every child participant. During the story's narration, the children were instructed to concentrate on the vibrant illustrations and the Tamil language. During the story-telling, the narrator employed suitable non-verbal communication, such as gestures and cues. If a child failed to grasp the narrative during the initial exposure, it was reiterated until a complete understanding was attained. After that, the children were instructed to recount their recently heard narrative. After the storyteller's narration, the children were given a 1–2 min break.

During the narration, the investigator used neutral transitional terms such as 'then', 'next' and 'after that' to encourage the children to continue retelling the story whenever they paused. The children were rewarded with candy on completing the task as reinforcement. An Olympus camera recorded audio and video of the investigator's narrative and the children's story retelling. The duration of the audiovisual recording ranged from 3 min to 5 min.

Analysis and transcription

Verbatim transcription was performed on the obtained samples. The researcher's neutral prompts, repetitive utterances, false starts, and the children's mazes were excluded from the analysis. The macrostructure of participant utterances was then analysed. The story-grammar components, including the setting (S), characters (C), initiating event (IE), internal plan (IP), attempt (A), outcome (O) and resolution (R) of the event, were examined according to Stein and Glenn's framework.²⁴ This study used the qualitative rating reported by Venkatraman

and Thiruvalluvan for story-grammar analysis.²⁰ The investigator prompts and mazes were removed before calculating the presence of each story-grammar element. The narrative samples of the story retelling were divided into utterances for detailed examination. A rating system from 0 to 3 was used for scoring, with 3 indicating an accomplished or detailed description of the component, 2 representing the main content of the element being described, 1 denoting a relevant attempt to describe the component and 0 indicating the absence of any attempt to describe the component.

Statistical analysis

The macrostructure parameters obtained from both groups were recorded in an MS Excel file, including the setting (S), characters (C), initiating event (IE), internal plan (IP), attempt (A), outcome (O) and resolution (R) of the event. The data were analysed using SPSS software (version 28). The means of the macrostructure measures for the retold narratives of the children with HI were compared with the established means of normally hearing children using the Mann-Whitney U test. A coefficient of approximately 0.947 was derived after testing the inter-rate reliability of all coded samples using Cohen's κ . The results indicate that the inter-rate consistency between the two rates is exceptionally high. A high Cohen's κ Score denotes better agreement between the independent raters.

RESULTS

The following are the statistical analysis results comparing typically developing children to children with HI regarding various story-grammar variables (table 2). Significant differences were found between typically developing children and children with HI in the use of characters ($U=25.000$, $p<0.001$, $r=-0.877$), setting ($U=14.000$, $p<0.001$, $r=-0.913$), initiating events ($U=7.000$, $p<0.001$, $r=-0.945$), internal plans ($U=30.000$, $p<0.001$, $r=-0.848$), attempts ($U=22.000$, $p<0.001$, $r=-0.877$), outcomes ($U=23.000$, $p<0.001$, $r=-0.877$) and resolutions ($U=12500$, $p<0.001$, $r=-0.931$). These findings demonstrate significant differences in story-grammar components between typically developing children and those with HI. The results highlight a substantial reduction in story-grammar elements during the narrative retelling task for children with HI.

DISCUSSION

The present study investigated the story-grammar analysis of narratives in children with and without HI, focusing on the complexity of story-grammar components. A deliberate matching strategy was employed in this study to effectively address potential age-related biases, ensuring that our group comparisons were both meaningful and reliable. It is essential to discuss the richness of these story-grammar elements in typical development and the

Table 2 Comparison of narrative macrostructure in children with and without HI

Story-grammar variables	Group	Mann-Whitney U test	Wilcoxon's W test	Z test	P value
Characters	Children with and without HI	25.00	145.00	-3.974	0.000*
Settings	Children with and without HI	14.00	134.00	-4.294	0.000*
Initiating event	Children with and without HI	7.00	127.00	-4.570	0.000*
Internal plan	Children with and without HI	30.00	150.00	-3.572	0.000*
Attempt	Children with and without HI	22.00	142.00	-3.962	0.000*
Outcome	Children with and without HI	23.00	143.00	-3.969	0.000*
Resolution	Children with and without HI	12.50	132.00	-4.332	0.000*

Grouping variable: Group.
 *p<0.001 (two-tailed).
 HI, hearing impairment.

specific challenges children with HI face in effectively using them to understand the unique narrative abilities of children with HI.

Characters, setting, initiating events, internal plan, attempt, outcome and resolution are fundamental story-grammar elements that contribute to narrative coherence and organisation.^{20,22} These elements reflect the ability to understand and convey mental states, establish context, depict motivations and demonstrate logical progression within a story.

Children with typical development exhibit well-developed skills in using these story-grammar elements, showcasing their ability to construct narratives with depth and complexity.²⁰ However, children with HI may face challenges fully using these elements. Each story-grammar component and its presentation in the elicited narratives of children with and without HI are discussed below.

Characters

Children without HI had higher mean character development ranks than those with HI. This finding suggests that children with HI may demonstrate a restricted use of nouns and pronouns, possibly due to differences in the quantity and diversity of language exposure and the input and rehabilitation methods compared with children with normal hearing.²⁵

Setting

Significant differences were observed in establishing the setting element, with typically developing children outperforming children with HI. This finding highlights the difficulties that children with HI may experience in acquiring a wide range of vocabulary words, which can impede their ability to describe and establish the setting of a story.²⁵

Initiating event

The results demonstrated significant differences in the initiating event element, with typically developing children achieving higher mean ranks. Children with HI exhibit difficulty stringing together a series of actions due

to their limited vocabulary and poor syntactical skills to effectively use the person number and gender markers to generate seamless narration.²⁶

Internal plan

Significant differences were found in the internal plan element, with typically developing children exhibiting higher mean ranks. This finding aligns with the theory of mind framework, as internal plans involve characters' thoughts and intentions. This finding suggests that children with HI may face challenges in understanding and expressing the mental states of story characters, potentially due to limited access to spoken language and delays in linguistic development.²⁶

Attempt

The findings revealed significant differences in the attempt element, with typically developing children outperforming children with HI. This result can be attributed to the theory of mind perspective, as understanding characters' actions and strategies requires understanding their mental states. Children with HI may face challenges in comprehending and expressing these mental states, impacting their ability to construct narratives with well-developed attempts.²⁵

Outcome

Significant differences were observed in the outcome element, with typically developing children achieving higher mean ranks. This finding can be attributed to the theory of mind framework, as accurately comprehending and expressing the outcomes of story events relies on understanding characters' mental states. Predicting outcomes also depends on the inherent ability to provide closure to the stimulus used for story-telling. Children with HI may encounter difficulties comprehending and expressing these outcomes, impacting their narratives' coherence and organisation.²⁶

Resolution

The results indicated significant differences in the resolution element, with typically developing children

exhibiting higher mean ranks. As reported in earlier literature, this story-grammar parameter was frequently sparse for children with typical development.^{20–22} This story-grammar component requires a complex understanding of a coordinated sequence of events to give closure to the story-telling higher mean ranks. As reported in earlier literature, this story-grammar parameter was frequently sparse for children with typical development.^{20–22} This story-grammar component requires a complex understanding of a coordinated sequence of events to give closure to the story. This finding suggests that children with HI may face challenges in comprehending and expressing the intentions and motivations of story characters, which are crucial for effectively depicting initiating events.^{25–26} This finding relates to the theory of mind framework, as constructing a coherent and well-organised resolution requires understanding the characters' mental states and the overall story structure.

Notably, although the story-grammar elements in question may present difficulties for children with HI, certain constituents may also prove intricate for children with typical development, as per Venkatraman. Although children's language ages were matched using a standardised test tool, the quantity of communication did not reflect its quality. This study on child cochlear implant users' narrative skills highlights qualitative differences and challenges faced in higher-level language tasks. Although limited in sample size, the findings provide valuable insights and encourage further exploration in this vital area. The general trend of diminished performance in these components among children with HI indicates a necessity for focused interventions and assistance to augment their narrative proficiencies. Studies by Uzunur, Spencer *et al* and Zamani *et al* reinforce that the story-grammar-based narrative intervention is effective for children with HI.^{15–17} While this study undoubtedly offers substantial contributions to the narrative analysis of children with HI, it is crucial to note that it exclusively assessed the story-retelling task. Nevertheless, it remains paramount to encompass a more comprehensive array of narrative skills, including personal narratives and story generation, in order to gain a more comprehensive understanding of these children's overall narrative performance.

CONCLUSION

Typically developing children construct narratives characterised by richness and depth, highlighting the complexity of story grammar components. However, children with HI face challenges in effectively using these elements, potentially due to limited access to spoken language, delays in linguistic development and difficulties in the theory of mind understanding. Comprehending these barriers can provide direction for creating custom-tailored interventions and strategies to promote the narrative proficiency of children with HI, thereby enhancing their linguistic and communicative abilities. Analysing narratives regarding story-grammar components would provide a

picture of the individual's ability to construct narratives and shed light on the narrative organisation and coherence inadequacies. An intervention plan based on the story-grammar components can facilitate the qualitative richness and appropriateness of narrative skills acquired by children with HI.

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Patient consent for publication Consent obtained from parent(s)/guardian(s).

Ethics approval This study involves human participants. The Institutional Ethics Committee (IEC) approved the study (project No. CSP/22/DEC/119/595) following a thorough review conducted at the Sri Ramachandra Faculty of Audiology and Speech-Language Pathology, Sri Ramachandra Institute of Higher Education and Research (SRIHER). Participants gave informed consent to participate in the study before taking part.

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Data availability statement Data are available upon reasonable request. The data are available upon a sincere request, which can be made by contacting the corresponding author via email.

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