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The effectiveness of using multi-sensory children's stories on vocabulary development in young deaf and hard-of-hearing children

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ABSTRACT

Young deaf and hard-of-hearing children enrolling in school in Sri Lanka often display language delay due to limited amplification and limited language stimulation. The scarcity of speech and language therapy support within the educational context at present necessitates a rethink of service-delivery models to reach more children. Multi-sensory stimuli and traditional children's stories have been used in speech and language therapy to promote vocabulary development in children experiencing language-learning difficulties. Fifteen deaf or hard-of-hearing children from three different educational contexts were offered a three week "*Katha malu*" multi-sensory children's story programme through the class teacher. The programme focused on developing receptive and expressive vocabulary of a set of 30 target words. The programme was offered using a combination of Sri Lankan Sign Language and Spoken Sinhala. The participants' receptive and expressive vocabulary knowledge on the target words was assessed using a specially devised picture-based vocabulary assessment pre- and post-intervention. The results show positive gains at both group and individual levels on receptive and expressive vocabulary skills. There was a positive effect of familiarity with the story with the overall vocabulary gains more prominent for the older, more traditional story. The findings of this study highlight the possibility of offering access to language stimulation programmes at classroom-level facilitated by the class teacher, under the guidance of a speech and language therapist.

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While globally, particularly in the Global North, early identification of hearing loss has been bolstered by the introduction of newborn hearing screening, unfortunately, this is not the case in Sri Lanka, or arguably other countries of the Global South (Olusanya, 2017). This has contributed to late identification of hearing loss

and late amplification. There is also a lack of uptake of sign language by parents during a child's early years (Hettiarachchi et al., 2019). These factors have resulted in many deaf and hard-of-hearing pre-school and primary school children enrolling in school late, often with delayed language skills. The limited access to language stimulation, be it sign language or spoken language, for deaf or hard-of-hearing children, appears to affect language competence significantly in pre-school and primary school children. Given that arguably the default language competence level is language delay due to limited language stimulation, there is an urgent need to offer accessible and intensive language enrichment programmes for all deaf and hard-of-hearing young children in Sri Lanka. With the limited number of speech and language therapists available locally at present and the demand for continued intensive therapy, whole-class based language stimulation therapy programmes could be an alternative service-delivery model to address this need.

Access to education

Access to free and compulsory education from 5 to 14 years is stipulated within the educational policies of Sri Lanka and enshrined within the ratification of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in 2016. Nevertheless, equal access to "education for all" remains an elusive hope, with deaf and hard-of-hearing children often excluded from higher education and overall educational attainment. Currently, there are 22 special schools that can be accessed by deaf and hard-of-hearing children in Sri Lanka, although there are no formally trained Teachers of the Deaf to support them. These educational contexts include instruction via only Sri Lankan Sign Language (SLSL), a Total Communication (TC) approach of verbal instruction in spoken Sinhala or Tamil supported by SLSL or an Auditory-Oral (AO) approach. The majority of current local educational contexts use SLSL instruction, with very few schools using a TC or an AO approach.

In contrast to the global strides made in early identification of hearing loss through newborn screening, Sri Lanka remains arguably behind with no current country-wide policy in place (Hettiarachchi et al., 2019). Additionally, the relatively high cost of hearing aids, particularly more powerful digital amplification and cochlear implantation, remains out of the reach of the majority of people in Sri Lanka due to socio-economic realities (Furuta & Yoshino, 1998), which has implications for early amplification and early intervention. Apart from the above, parents of children who are deaf often do not use SLSL, which has resulted in many deaf and hard-of-hearing children entering school late, usually with a language delay in SLSL and in verbal language due to limited language input in the home environment (Hettiarachchi et al., 2019). This reflects the minimal opportunities for parents of pre-school deaf children to learn SLSL.

Using traditional children's stories

Sri Lanka, similar to other global South countries in South Asia and Africa, has a long oral tradition of narrating traditional stories and moral fables to children. The often simple storyline and repetitive nature of traditional children's stories has the potential to enable easier understanding and recall by young children. A commonsense view of the existence of cross-cultural children's stories through an oral tradition suggests simplicity and familiarity. Porras Gonzalez (2010) asserts that traditional stories allow for scaffolding of language-learning within a culturally sensitive context, which promotes acquisition of vocabulary and syntactic structures. Encouraging vocabulary knowledge is acknowledged to be a key component of any effective literacy programme (Graves, 2016).

Using multi-sensory stimuli

Heathfield (2011, cited in Kirsch, 2016) recommends incorporating a range of strategies, such as actions, gestures and mime, repetition of key phrases, tone of voice, use of props, interactive audience participation, and character empathy and expression, to enable language comprehension. There is consensus among researchers that vocabulary teaching should include both explicit and implicit components for first and second language acquisition (Laufer, 2005; Schmitt, 2008; Zyzik, 2011). Global academic research consisting of rigorous intervention studies, together with classroom observations, illustrate the negative impact of an impoverished vocabulary on literacy skills (Graves, 2016; Kirsch, 2016; Quigley, 2018). Strategies identified to remedy word poverty include the pedagogical strategies of repetition and review, word walls and word webs, displaying fascinating words and "word consciousness", creating extensive learning experiences, computer-assisted learning devices, a four-part vocabulary acquisition approach (Graves, 2016) and storytelling (Kirsch, 2016).

A review of the literature on the use of storytelling with children who are deaf or hard-of-hearing indicates a growing interest in the use of apps and technology and interactive storytelling strategies (Aristizábal et al., 2017; Beal-Alvarez & Huston, 2013; Eden, 2014; Malzkuhn & Herzig, 2013) to support literacy, sign language, narrative skills, and communication skills. In particular, this has included e-learning tools for interactive storytelling that offer opportunities to generate their narratives (Al-Mousawi & Alsumait, 2012; Alsumait et al., 2015), book sharing (Swanwick & Watson, 2007), and modelling reading vocabulary (Hermans et al., 2008). In Sri Lanka, teachers arguably favour didactic teaching strategies that rely on a student's rote memorisation skills to acquire knowledge (UNICEF, 2016).

There is broad interest and use of multi-sensory teaching methods within speech and language therapy to support language acquisition in children experiencing language-learning difficulties (Caldwell, 2007; Corke, 2002; Coupe O'Kane

& & Goldbart, 1998; Fyfe, 2001; Grove & Park, 1996, 2001). Its use, particularly among children with intellectual disabilities, has highlighted its benefit to enable access to stories, literature and theatre (Grove & Park, 2001). Within the context of a sign language or TC school, one can also take advantage of combining iconic gesture and voice with imagination (Mellon, 2003) to promote expression in early communication. Combining movement with gesture has been found to enable vocal output and increased receptive knowledge (McGregor, 2008). Adopting a multi-sensory pedagogical approach to vocabulary teaching promotes a sensory-learning experience, rather than lexical learning through one didactic approach. This shapes the theoretical underpinnings of multi-modal pedagogical methods found to support children with language-learning difficulties due to intellectual disabilities (Caldwell, 2007; Corke, 2002; Coupe O’Kane & Goldbart, 1998; Fyfe, 2001; Grove & Park, 1996, 2001). This may be of particular relevance to deaf and hard-of-hearing children who may require additional visual and kinesthetic input apart from auditory input, to acquire age-appropriate vocabulary skills. Multi-sensory interactive storytelling also cultivates group participation and group work (Coigley, 2008).

Methods

Participants-children

This study included 15 young deaf and hard-of-hearing children aged between 5;0 and 7;0 years, with five male and 10 female students (Table 1). While 12 children were from a large School for the Deaf, two of the children were attending a special unit attached to a mainstream school and one child attended a small special school. Both the special unit and the small special school had children with a range of disabilities with only one or two deaf or hard-of-hearing children. The children either had no amplification, late amplification or late and inconsistent amplification with minimal, if any, access to sign language at home, resulting in language delay (in spoken or sign language) in all the children included compared to language development norms.

Participants-teachers

Of the two teachers at the large special school, the pre-school teacher has 22 years of teaching experience at the school and has followed many in-house sign language training programmes. The teacher of the primary school has been a teacher at the school for 11 years, has also followed a few in-house sign language training programmes, and has followed a one-year Diploma in SLSL offered by the National Institute of Education in Sri Lanka. They are both able to use sign and spoken Sinhala simultaneously and move between the languages with ease. The teacher at the smaller special school has completed

Table 1. Participant Demographic details.

Participant	Age	Gender	First Language	Diagnosis	Amplification	Setting
P1-Gimhani	5;7	Female	Speech and sign	Bilateral severe-profound hearing loss	Using analog amplification for 1 year 2 months-inconsistent use	Special Unit attached to a mainstream school
P2-Madhusan	5;1	Male	Speech and sign	Bilateral severe-profound hearing loss	Using analog amplification for 1 year 8 months-inconsistent use	Special Unit attached to a mainstream school
P3-Gangi	5;0	Female	Speech and sign	Bilateral moderate-severe hearing loss	Using bilateral analog hearing aids for 6 months	Special school
P4-Sedhuka	5;2	Male	Sign	Bilateral profound hearing loss	No amplification	Pre-school of a large special school
P5-Prashan	5;4	Male	Sign	Bilateral severe-profound hearing loss	No amplification	Pre-school of a large special school
P6-Savindha	5;6	Male	Sign	Bilateral profound hearing loss	No amplification	Pre-school of a large special school
P7-Malik	5;0	Male	Sign	Bilateral profound hearing loss	No amplification	Pre-school of a large special school
P8-Radika	5;0	Female	Sign and speech	Bilateral severe-profound hearing loss	Using analog hearing aids for 8 months	Pre-school of a large special school
P9-Manuja	6;7	Male	Sign	Bilateral profound hearing loss	No amplification	Grade 1 of a large special school
P10-Vinura	7;0	Male	Sign and speech	Right profound and left severe-profound hearing loss	Using digital amplification on his left ear for 2 year 3 months	Grade 1 of a large special school
P11-Geethika	6;9	Male	Sign	Bilateral profound hearing loss	No amplification	Grade 1 of a large special school
P12-Erangi	6;11	Female	Speech and sign	Bilateral severe-profound hearing loss	Using bilateral analog hearing aids for 3 years 3 months	Grade 1 of a large special school
P13-Varuna	6;0	Male	Sign	Bilateral profound hearing loss	No amplification	Grade 1 of a large special school
P14-Hiran	6;11	Male	Sign	Bilateral profound hearing loss	No amplification	Grade 1 of a large special school
P15-Savithri	6;10	Female	Speech and sign	Right profound hearing loss and left severe-profound hearing loss	Using digital amplification on left ear for 2 years 3 months	Grade 1 of a large special school

Note. All names have been changed with pseudonyms and participant codes used throughout.

a one-year Diploma course in Special Education from the National Institute of Education in Sri Lanka and has enrolled in the SLSL course. The teacher of the special unit attached to the mainstream school is a trained special education teacher from a National College of Education. The latter two teachers were introduced to the target signs within the training programme and were only using the target single signs while narrating the stories in spoken Sinhala.

Researchers

The sign language used in this study is SLSL. With regard to signing competence, the first author has completed a one-year Diploma in SLSL, has level two certification in British Sign Language, and incorporates SLSL into speech and language therapy intervention, wherever relevant. The third author is a competent user of SLSL, having worked for over 20 years as a special education teacher, currently living on-site at the large School for the Deaf where her husband works.

Settings

The large special education school has adopted a TC approach in the pre-school and primary school with primacy given to spoken language with lip-reading and SLSL support. In contrast, the special unit attached to a mainstream school and the other small special school only used spoken Sinhala. This may be reflective of only having one or two hard-of-hearing children at the setting.

Ethical considerations

The study was afforded ethical approval by the Ethics Review Committee of the Faculty of Medicine, University of Kelaniya, Sri Lanka. This was followed by permission from the Principals/Directors of the settings to conduct the study, as well as consent from the parents to include their children in the study. The names of the participants have been changed with pseudonyms substituted for real names to safeguard confidentiality.

Intervention approach

The “*Katha malu*” storyboxes therapy approach combined key features of non-directive play or child-directed speech and didactic teaching techniques to aid language-learning. Among the non-directive child-directed-speech features incorporated were acoustic highlighting (Talbot, 2002), of pausing before target words in the story and stressing of keywords using intonation patterns. This feature was deemed useful for the hard-of-hearing children in this study who use some level of amplification. In addition, modelling was to be offered via recasts and expansions (Kelman & Schneider, 1994; Law, 1992; Owens,

2005; Snow, 1995) in both sign and oral language, when the children were re-telling the stories. As the teachers at the larger special school are competent at using sign language at the pre-school/primary school level, a simultaneous combination of sign and spoken words were used to reiterate child utterances through recasting their sentence structure and extending it through word/sign additions. The teachers at the two smaller settings used primarily spoken words to recast and expand child utterances, but occasionally used single signs that were introduced within the training for the target concepts of the intervention programme.

In-line with the didactic teaching tradition of “instructional talk” in South Asia (Chapin, 2014; Rowsell, 2015; Stolyarova, 2011), direct language-prompting strategies were incorporated, making the approach culturally appropriate. This included the strategies of mand modelling, fill-ins, elicited imitation and simple “wh” questions; all features observed within parent–child interaction among Sri Lanka parents (Hettiarachchi, 2010), and reported in cross-cultural research on parent–child interaction (Burns & Radford, 2008; Hettiarachchi, 2010; Hoff & Tian, 2005; Simmons & Johnston, 2007; Wong & Johnston, 2004). With these didactic language stimulation strategies under consideration, the “*Katha malu*” programme, which was devised for use with any young child experiencing language-learning difficulties was amended, taking account of the particular needs of the local deaf and hard-of-hearing students.

The mand-model procedure entails the adult modelling and/or requesting or “manding” the child for a response (Law, 1992; Warren et al., 1984). In this case, the mand-model technique included a model in sign and in spoken word, promoting the child to copy the model. When using this technique with deaf and hard-of-hearing students, it was important to gain their full attention as they need to be looking at the therapist/teacher to learn the target sign or word through lip-reading. So, when the therapist/teacher was next to the child, he/she was given a physical prompt (i.e. tap on the hand) to look at the adult, before the target sign and word within a story was offered. The delivery of target words in close proximity enabled children to use lip patterns to aid word learning. This led to the use of elicited imitation (Hettiarachchi, 2010; Hoff et al., 2002; Hoff & Tian, 2005; Schieffelin, 1985) where the child was requested to repeat the target vocabulary word or “say-after-me”, in this case, by copying the target sign or word.

When using fill-ins and pausing (Schieffelin, 1985), the therapist or teacher presented a lead-in phrase connected to the story using key sign and simple spoken language. The therapist/teacher paused before the target word with an expectant look, encouraging the children to produce the relevant sign and word. It was anticipated that the multi-sensory objects included in the story-boxes would serve as aide-memories to help recall target words and wordlearning.

Although there is a lack of agreement on the use of these didactic language-teaching techniques, particularly with children with language-learning difficulties (Girolametto et al., 2000; Roberts et al., 1991; Tizard & Hughes, 1984), these features were included given their prevalence in cross-cultural research, including in local research (Hettiarachchi, 2010). The use of these techniques within the language-learning context was anticipated to offer semantically contingent language that could aid language learning and word recall.

The research base to support the importance of parental involvement in language enrichment programmes (Girolametto et al., 2000; Kelman & Schneider, 1994; Law, 1992; Owens, 2005) and early childhood education (Ma et al., 2016) is unequivocal. While ideally, parents should be part of the “*Katha malu*” programme too, the majority of students at the main School for the Deaf included in this study were residential, and therefore, it was decided not to include parents in the intervention study on this occasion.

Devising the storyboxes

Two local children’s stories were used; one a very traditional old children’s story titled “*Gamarale divyaloke giya haeti*” (Disanayake, 2015) or “*How the farmer went to heaven*”, and the other, a more recent children’s story of “*Uda giya baba*” (Wettasinghe, 2012) or “*How baby was blown up (to the sky)*”. The first story, which is somewhat fantastical, was chosen due to its familiarity amongst most children, as it is both a traditional and popular story. The second story was selected as the context of a little child refusing to eat is very much within the lived experience of many children, as arguably, Sri Lankan parents fret overfeeding their children. Based on the two storybooks, the researchers devised a simple story script together with a simple song for each, and identification of key signs. Additionally, locally relevant multi-sensory objects were identified and sourced.

The storybox for “*Gamarale divyaloke giya haeti*” (Disanayake, 2015) included ten target multi-sensory objects of a coir rope covered in grey rough-textured corduroy cloth for the elephant’s tail, an orange cloth elephant with embroidery needlepoint work, a red and black check cloth to be worn as a sarong (for the farmer), a replica traditional coconut fire-torch created with a dried coconut spathe of a dried coconut leaf together with orange synthetic silk cloth strips denoting fire, painted rigid vegetables (potatoes, carrots, onions), small coloured pebbles as gems inside secure pouches, strings of fake pearls and gold chains, gold paper coins, a traditional *indikola* (indi-leaf) box to contain the gems, coins and jewellery, and a pair of fake toy glasses for the grandmother character of the story. Similarly, the storybox for “*Uda giya baba*” (Wettasinghe, 2012) also contained ten multi-sensory objects including a pink plastic plate, a blue paper cup, a little red plastic water-spray can made using a recycled perfume bottle, a pastel-coloured striped cloth for the main character of a little girl, a traditional hand-made palm-leaf fan used to create the effect of

wind blowing, a hand-made wooden bird on a string, a traditional palm-leaf straw hat as a bird's nest, a cottonwool ball for clouds within a soft net pouch, wooden play trees, and a small traditional winnowing fan with a sheaf of dried rice attached.

Teacher-training

Sri Lanka has a long tradition of oral storytelling of folktales and of sharing Buddhist and Hindu religious and moral stories. For instance, in the public sharing and re-telling of Buddhist stories, large constructions known as pandols are made on the roadside using paintings depicting scenes of stories related to Lord Buddha decorated with a variety of coloured light-bulbs, together with auditory recordings of the story with traditional recitations of prayers and rhythms. Pandols are used to narrate religious stories on the Vesak full-moon day in May each year to commemorate Lord Buddha's birth, enlightenment and death. Historically, the pedagogical method used in Sri Lanka is rigid, reliant on rote memorisation, with the teacher verbally explaining facts explicitly, which the students diligently document as a written note (UNICEF, 2016). Combining these two traditions, the "*Katha malu*" intervention programme focuses on offering direct models of the target stories through SLSL and/or spoken language and encouraging elicited imitation by creating opportunities for the students to re-tell the stories using a range of carefully chosen multi-sensory objects.

The training of the class teachers (two from the large special school and one each from the other two smaller settings) was offered individually given the small number of participants. The training session was approximately two hours and included both a theoretical presentation, discussion, modelling of the activities live in the classroom with the relevant students and opportunities for hands-on experiential language with specific feedback offered. The training session included a brief introduction to the theoretical underpinnings of the approach and an explanation with examples and modelling of each target language teaching/learning technique. This was followed by two-to-three demonstrations of the stories in the classroom with the students. Next, the teacher was invited to co-facilitate the narration of the story, and finally, to teach one of the stories on her own. Feedback was offered as necessary and opportunities given to ask questions and to seek clarification on any aspect of the programme.

Intervention programme

The "*Katha malu*" whole-class multi-sensory traditional stories approach was introduced to the classes and the class teachers by the three authors. The first author is a speech and language therapist; the second has a background in linguistics and in teaching English as a second language at university; the third

author is a trained special education teacher. Following its introduction, the programme was offered to the participants of each class daily for three weeks (15 sessions) through the class teachers. The running of the programme was monitored twice a week at the large special school. In the two other settings, mainstream peers from the mainstream classrooms were included in the storyboxes session at the special unit, and siblings were included when possible at the small special school. Only one monitoring visit was possible to the two smaller settings due to distance, as the researchers lived in the capital city and the schools were in a more remote area of the country.

The children were positioned in a story circle, with the adult as part of the circle so that she was visible to all. Each storybox session lasted approximately 30-minutes with a combination of watching and listening to stories, facilitated re-telling and supported role-play, using the target multi-sensory objects and materials as aids. Each session began with the narrating of a target story using a TC approach at the large special school and in spoken Sinhala with target signs in the other two smaller settings. The simultaneous use of SLSL with spoken Sinhala with voice was used by the two teachers of the large School for the Deaf as a TC method is used usually at the school. The researchers introduced the stories to these two teachers using a combination of sign and spoken Sinhala, with feedback offered by the researchers, as appropriate, during observational visits. The other two teachers presented the stories in spoken Sinhala with the target concepts offered in single signs using SLSL as introduced by the researchers. Target signs were incorporated as the three children from outside the city displayed language-learning difficulties with very limited spoken language. The sign support was expected to encourage receptive language understanding of the target vocabulary. The accuracy of the signs used to narrate these two stories was checked by four Deaf sign-language researchers attached to the Centre for Disability Studies of the Department of Disability Studies, University of Kelaniya, who are currently undertaking research on documenting signs across the country (Hettiarachchi et al., 2019).

The multi-sensory objects and materials were used in telling the stories and handed round the group, giving each child the opportunity to handle the objects and make a direct connection with the target words. Story one, *“How the farmer went to heaven”*, was introduced and repeated over five sessions, followed by the introduction of story two, *“Udagiya baba”*, which again was worked on for five sessions, ending with five more sessions with both stories together.

Assessment

The intervention programme focused on developing receptive and expressive vocabulary skills. Based on the key words/concepts contained in the two stories, a list of 30 target words was compiled, consisting of 10 nouns and five verbs from each story. The 30 words formed the basis for the receptive

vocabulary test and the expressive vocabulary test. Currently, there are no formal standardised assessments of generic receptive and expressive vocabulary skills in Sinhala or Sri Lankan Sign Language. Therefore, two picture-based assessments; one to assess target receptive vocabulary and one to assess target expressive vocabulary, were devised to be presented via PowerPoint. In the receptive vocabulary test, four pictures were offered per slide. This included the target picture, another that is similar in shape to the object or that uses a phonemically similar hand-shape to the sign, a picture of an item that is semantically related and one that is phonemically similar in Sinhala to the spoken word. For instance, for the target word “gems” (“manik” in Sinhala), a picture of gems was seen on the slide together with a picture of coins (similar sign to target and similar shape to the object), a chain (semantically related) and a flower (phonemically related; “mal” in Sinhala). Both assessments targeted the same vocabulary knowledge with the expressive vocabulary test presented before the receptive vocabulary test to minimise any learnt effects. The SLSL signs for the target words within the receptive and expressive vocabulary test were verified with four Deaf sign-language researchers attached to the Centre for Disability Studies of the Department of Disability Studies, University of Kelaniya.

In the expressive vocabulary test, one target picture was presented per slide with a request to name the target using sign or spoken Sinhala. The target question, “what is this?” was used with the nouns and “what is he/she doing?”, with the action pictures. In the receptive vocabulary test, four pictures were presented on each slide, with the target sign and word offered, with the participant expected to point to the target picture. Both tests were pre-tested with one child (6;2 years) of a parallel-class, in the large special school, who was not part of the intervention study. The participant’s attention was gained before presenting the word/sign, so as not to be distracted by the stimuli. All participant responses were documented directly on individual response sheets. Two targets, “mango” and “mother”, were found to have dialect variation in the signs used at the large special school compared to the signs used by the researchers. The two revised tests were conducted with the 15 participants individually before the introduction of the “*Katha malu*” programme and again after the intervention. Field notes were also kept regularly by the first researcher and the class teachers on any observations made during the “*Katha malu*” sessions or any feedback received from the teachers. A note was made of the variety of accurate responses based on dialect variation, with all accepted as correct answers. Additionally, the feedback suggested that two of the pictures; fire and gems, were unclear to the pre-test participant. As a result, two new pictures that are clearer were incorporated into the test.

Data analysis

The participant data on the receptive and expressive vocabulary tests were collected at the start and end of the intervention (Allen, 2017), and were analysed to

identify any changes in accuracy and error patterns produced. As the assessment was only at single-word level of sign or spoken word understanding and use, the researchers felt they were adequately competent to assess the students on the small closed-set of targets. The data were coded as a correct response (CR) or an incorrect response (IR). In addition, the incorrect responses were analysed further to uncover the production of semantically related words in SLSL and/or spoken Sinhala(SE) and no response (NR). The field notes and teacher and participant feedback were reviewed, and a simple thematic analysis undertaken.

Results

Overall, the participant responses on the receptive and expressive vocabulary tests pre- and post-intervention revealed positive changes in sign and word knowledge and use.

Receptive vocabulary skills

A positive change in the understanding of the target 30 vocabulary items was observed both at a group and an individual level. A Wilcoxon Signed-Ranks Test indicated that post-test scores (Mean (M)=16.7, Standard Deviation (SD)=7.23) were statistically significantly higher than pre-test scores (M=8.3, SD=6.23), $z = -3.19$, $p = .001$. These results suggest that the intervention programme does have a positive effect on acquiring target receptive vocabulary knowledge. At an individual level, gains in the understanding of the target vocabulary were observed in 13 participants, to a greater or lesser degree, with two participants' scores remaining the same (Figure 1).

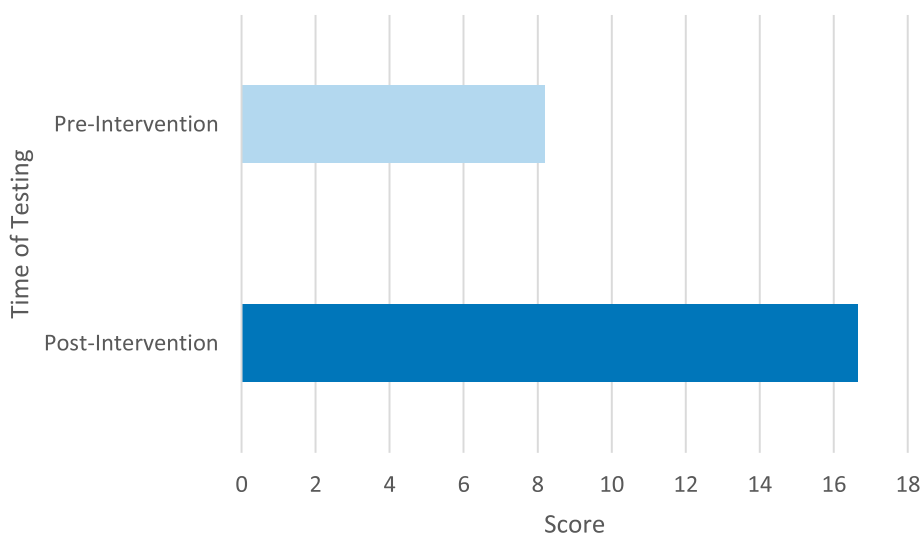


Figure 1. Pre- and Post-Intervention Receptive Vocabulary Scores: Group-Level.

An analysis between the traditional story (Story one: *Gamarale divyaloke giya haeti*) and the newer children's story within the children's lived experiences (Story two: *Uda giya baba*) showed vocabulary gains on both stories post-intervention. A bigger increase in the average group score on the understanding of target words was associated with the traditional story (Story one) from a Mean of 5.6 (SD = 4.12) to a Mean of = 10.5 (SD = 4.61), compared to the newer children's story (story two) from a Mean of 2.7 (SD = 2.23) to a Mean of 6.2 (SD = 3.17). A Wilcoxon Signed-Ranks Test showed that post-test scores of story one were statistically higher than the pre-test scores, $z = -3.08$, $p = .002$. Similarly, a Wilcoxon Signed-Ranks Test revealed that post-test scores for story two were statistically higher than pre-test scores, $z = -3.20$, $p = .001$. These results suggest that the intervention programme does have a positive effect on target receptive vocabulary knowledge of both stories.

At an individual-level, nine participants showed an increase in story one (*Gamarale divyaloke giya haeti*) compared to story two, three participants gained a better score post-intervention on story two (*Uda giya baba*) compared to story one, and three participants showed no change in the understanding of target vocabulary on either story post-intervention (Figure 2).

Expressive vocabulary skills

Overall, at group-level, the use of the target words in SLSL and/or spoken Sinhala Showed an increase in test scores from pre- to post-intervention. A Wilcoxon Signed-Ranks Test indicated that post-test scores ((M) = 11.0, SD = 6.11) were statistically significantly higher than pre-test scores (M = 4.3, SD = 3.86), $z = -3.41$, $p = .001$. These results suggest that the intervention programme does have a positive effect on acquiring target expressive vocabulary knowledge. At an individual level, an increase was observed in the use of the 30

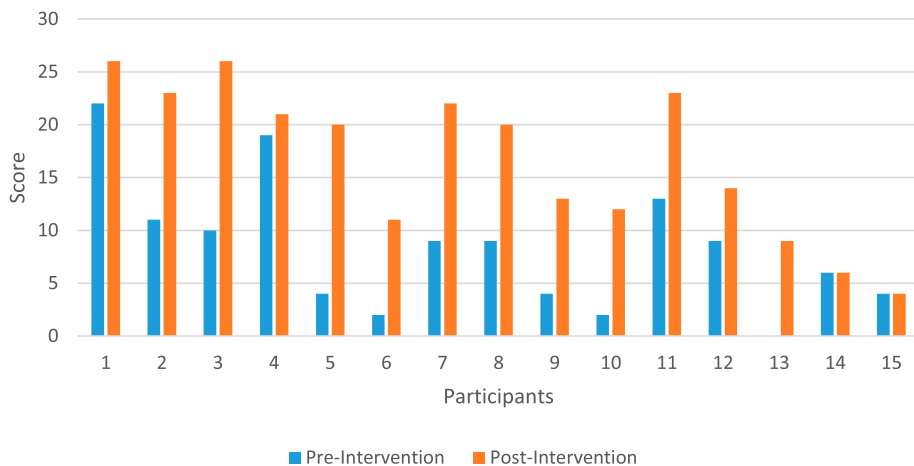


Figure 2. Pre- and Post-Intervention Receptive Vocabulary Scores: Individual-Level.

target vocabulary in spoken Sinhala and/or SLSL post-intervention by all of the participants, albeit indicating different degrees of vocabulary gain (Figure 3).

Analysed based on the stories, more gains were observed in the use of the 15 target vocabulary items of story one (*Gamarale divyaloke giya haeti*) in contrast to the 15 target vocabulary items of story two (*Uda giya baba*), although an overall increase in target vocabulary was seen in both stories (Figure 4).

A bigger increase in the average group score on the use of target words was associated with story two pre-intervention ($M = 1.1$, $SD = 1.39$) to post-intervention ($M = 3.2$, $SD = 2.60$), compared to story one pre-intervention ($M = 2.9$, $SD = 2.02$) to post-intervention ($M = 8.1$, $SD = 4.48$). A Wilcoxon Signed-Ranks Test showed that post-test scores of story one were statistically higher than the pre-test scores, $z = -3.33$, $p = .001$. Similarly, a Wilcoxon Signed-Ranks Test revealed that post-test scores for story two were statistically higher than pre-test scores, $z = -3.41$, $p = .001$.

At individual-level, all the participants showed a positive change in target vocabulary use of both stories (Figures 5 and 6). The change was greater in story one for 13 participants, with a slightly better change in story two seen in one participant and a similar gain of one new sign/word observed in another participant.

Analysis of the error patterns produced by the group as a whole showed a decrease in the total number of semantic errors and no responses across the two test points when the participants were assessed at the end of the intervention compared to the participant responses on assessment at the start of the intervention (Figure 7).

A closer qualitative analysis of error patterns of the participant responses indicated the production of semantically related concepts (Table 2).

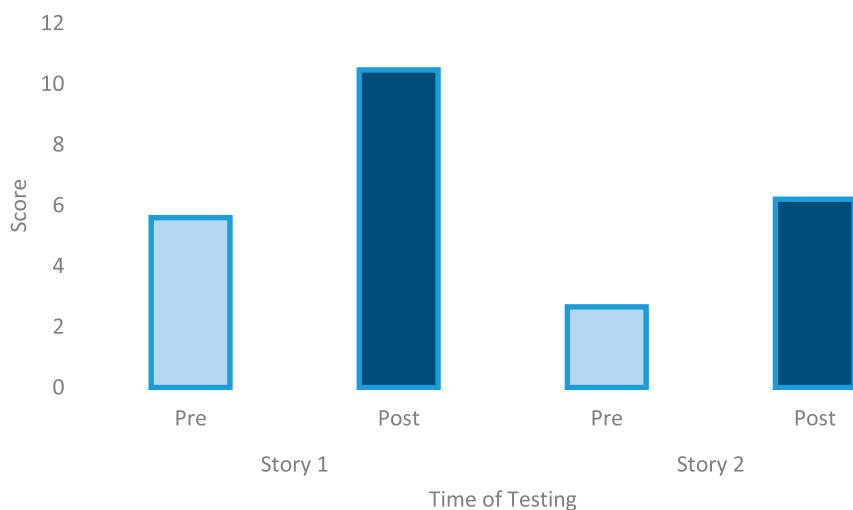


Figure 3. Pre- and Post-Intervention Receptive Vocabulary Scores by Story: Group-Level.

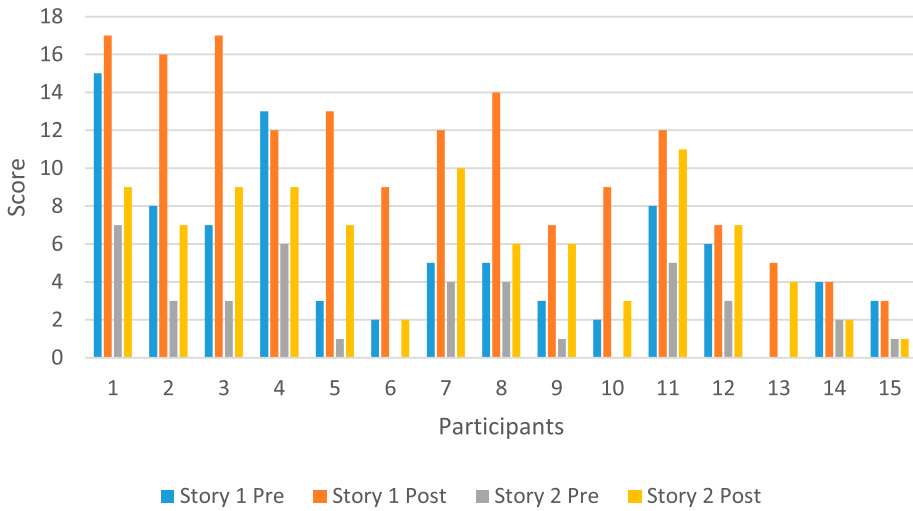


Figure 4. Receptive Vocabulary in SLSL and Sinhala Pre- and Post-Intervention, 30 Test Items.

A review of the field notes and compilation and analysis of the teacher and student feedback suggests positive comments on motivation and engagement during the storybox sessions and co-operative working with peers. Referring specifically to the high level of motivation and engagement during these sessions, Kumari, the teacher at the special unit attached to a mainstream school said, *“the children in my class respond well to the stories They pay attention during the story.”* Adding to this, some of the mainstream peers joining the story-box sessions at the Special Unit also expressed their motivation and pleasure at joining the sessions. Duminda, the Founder/Director of the small special school, who has a background in drama, echoed similar sentiments as he reported that

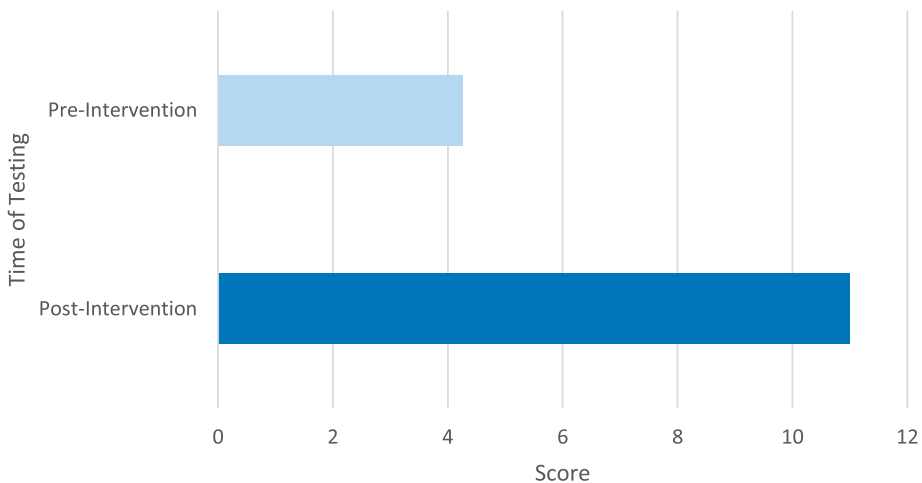


Figure 5. Pre- and Post-Intervention Expressive Vocabulary Scores: Group-Level.

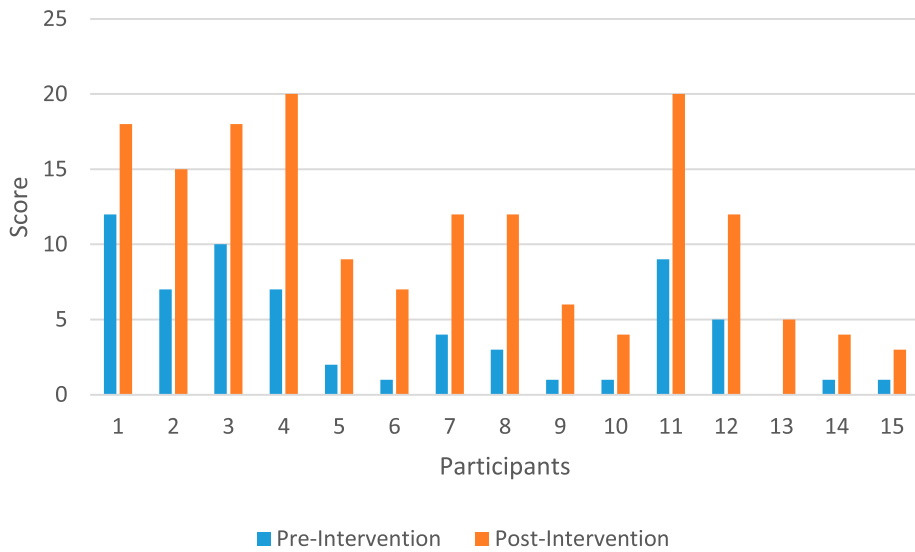


Figure 6. Expressive Vocabulary in SLSL and Sinhala Pre- and Post-Intervention, 30 Test Items.

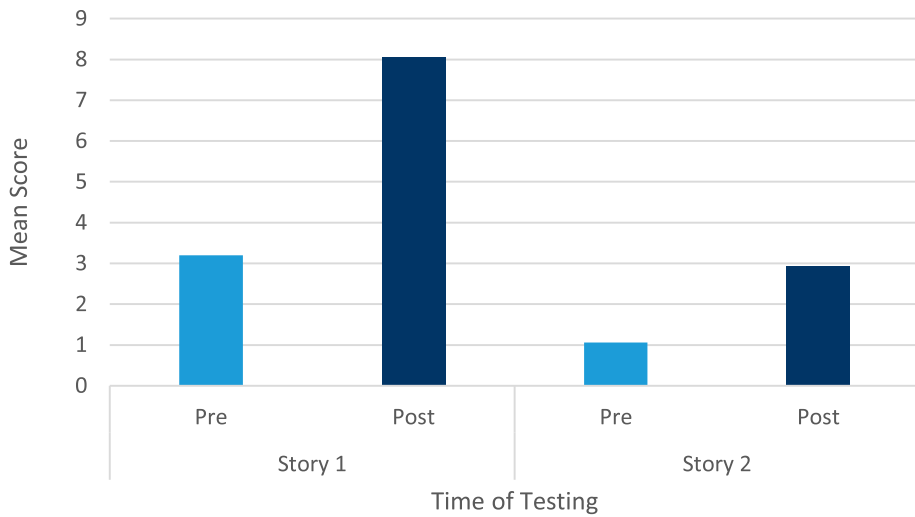


Figure 7. Mean Expressive Vocabulary in SLSL and Sinhala Pre- and Post- Intervention, with Two Stories.

Table 2. Illustration of Error Patterns.

Participant	Target	Pre-Intervention Response	Post-Intervention Response
Varuna (P13)	girl	mother	girl
Malik (P7)	gold coins	shiny	gold coins
Radika (P8)	gold coins	(no response)	money
Savithri (P15)	traditional torch	(no response)	lantern
Hiran (P14)	elephant’s tail	snake	tail elephant

"the children are used to doing drama and dance because of Nishantha's and my background at the SuneraFoundation.¹ It was easy for us to incorporate the stories. The children enjoyed it a lot. Not only Gimhani², all the children learnt from it." Our observations confirmed the feedback from the teachers and students but also showed how the student motivation and enthrallment with the objects could be challenging at times for a couple of the teachers with less experience of teaching deaf or hard-of-hearing children. This was specifically due to instances where the children were looking down at the objects in their hands rather than watching the teacher to follow her. The objects presented to symbolise gems appeared to be of particular interest, with children fighting to get it and trying to hide it from others (Figures 8 and 9).

Our observations revealed that it was not only the children who were motivated by the storybox programme, but also the teachers. Madhusha, the class teacher of the pre-school at the large special school, had undertaken related activities. Explaining this, she said, *"I did some other activities, miss. I got the children to make a large collage with me on the gamarale (farmer) story. They really liked it, so we also made a hand-made movie box with pictures of the story that the children drew."* The collage was up on the wall during and at the end of the intervention.

Additionally, in a conversation with Madhusha and Sandya, the class teacher of grade 1, they shared instances of co-operative co-working. As Sandya put it, she noted that *"the children liked the part about the elephant's tail in the story ... They worked together, pulling on the tail."* Madhusha agreed saying, *"yes, they work well together. ... They would cling on to me and fall with such force. I was worried that they would hurt themselves."*

Varuna (P13) who is 6 years old with bilateral severe-profound hearing loss who does not use amplification, is a case in point. Subjectively, he appeared very shy when we met him at the start of the programme. Referring to the children in her class and to Varuna in particular, his class teacher said, *"They can't. Their brains are upset. He is a Kadanadas"*. The term "Kadanadas" (a person who breaks things) appears to be used in a derogatory sense to refer to a person experiencing a learning disability who is considered "clumsy". On assessment pre-intervention, Varuna (P13) was not able to indicate any target item on the receptive vocabulary test. During the storybox sessions, Varuna was observed to sit attentively, waiting for his turn to manipulate the objects, appearing to like the elephant soft toy, elephant's tail (created with coir and grey corduroy cloth) and the traditional torch (created using a dried coconut spathe with the tough dried leaf connected to the coconut flower used in particular together with orange synthetic silk cloth). At the end of the therapy programme, Varuna's

¹Well-known theatre company for children with disabilities.

²Not the participant's real name. A pseudonym has been used to maintain confidentiality.

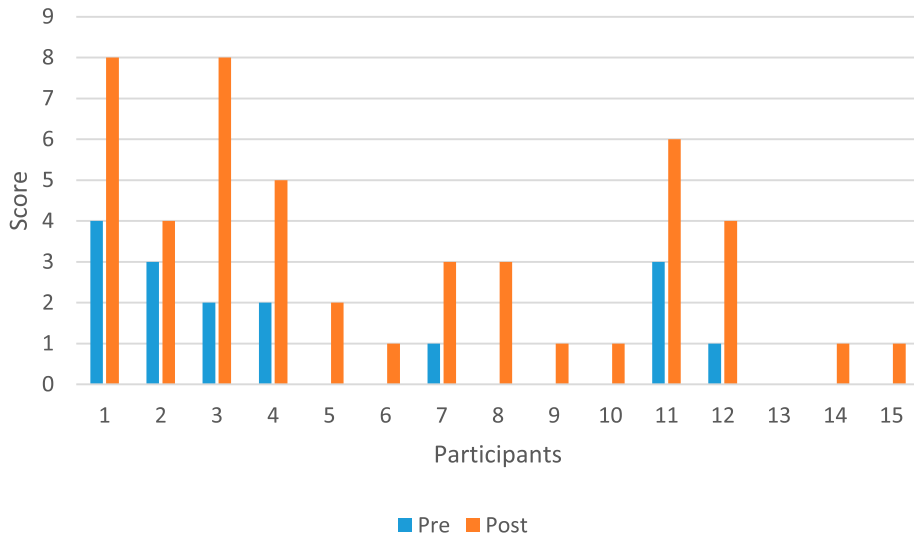


Figure 8. Pre- and Post-Intervention Expressive Vocabulary Scores for Story 1: Individual-Level.

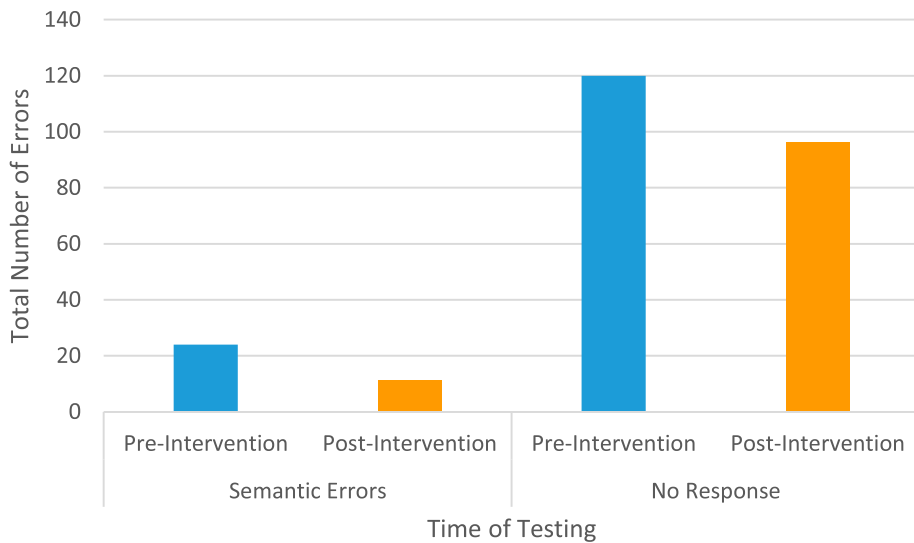


Figure 9. Pre- and Post-Intervention Analysis of Whole-Group Error Patterns.

understanding of the target receptive vocabulary had increased from 0 to 9 and his expressive use of target signs from 0 to 5.

Discussion

An intervention programme targeting receptive and expressive vocabulary skills based on children's traditional and familiar stories and enriched by multi-sensory objects was conducted daily for three weeks with 15 deaf or hard-of-hearing

children in three special education settings. It included a combination of culturally relevant, non-directive and directive language teaching strategies used widely within speech and language therapy. Pre- and post-intervention measures on target receptive and expressive vocabulary were undertaken with each participant using a PowerPoint format. The results showed positive language gains in both receptive and expressive vocabulary skills on the targeted vocabulary.

The findings in this study of vocabulary growth following a multi-sensory storytelling approach have resonance with previous literature (Caldwell, 2007; Corke, 2002; Coupe O’Kane & Goldbart, 1998; Fyfe, 2001; Grove & Park, 2001; Hettiarachchi & Ranaweera, 2013). While this may not be a surprise, many of this research has focused on supporting children with language learning difficulties due to intellectual impairment; the current study extends the use of this approach to deaf and hard-of-hearing children.

The multi-sensory stimuli were specifically chosen for this particular group of participants, with primacy given to the visual aspect and tactility of the objects rather than to auditory features. Many opportunities were also offered for experiential learning, which may have aided vocabulary acquisition. There is some evidence to suggest that word learning is aided when iconic gesture with voice or sensory word-learning experiences are offered (McGregor, 2008; Mellon, 2003). Nevertheless, while it is not possible at present to determine which particular sensory stimuli is of more assistance to deaf or hard-of-hearing children, the combined multi-modal approach appeared to support language-learning.

Together with the multi-sensory approach, the use of a combination of non-directive and didactic language teaching strategies seemed to assist word learning. Again, it is not possible to determine the relative merits of the non-directive vs. directive strategies, let alone the strategies of each trialled within this approach such as acoustic highlighting (Talbot, 2002), recasts and expansions (Kelman & Schneider, 1994; Law, 1992; Snow, 1995), mand modelling, fill-ins, elicited imitation and simple wh questions (Burns & Radford, 2008; Hettiarachchi, 2010; Hoff & Tian, 2005; Lieven, 1994; Seeff & Bortz, 1994; Simmons & Johnston, 2007; Wong & Johnston, 2004). What is clear is that the combination used of culturally relevant non-directive and didactic language teaching strategies encourage word-learning among deaf and hard-of-hearing children within a special education context.

The results also suggest the influence of familiarity with the story. The participants were better able to understand, recall and use the target vocabulary of the more familiar traditional story of *“Gamarale divyaloke giya haeti”*. This may be because a traditional story is formulated in concordance with local culture, and a culturally sensitive context has been asserted to reinforce and facilitate language learning (Porrás Gonzalez, 2010). Furthermore, the observation and feedback implied a promotion of team work. This is in-line with Coigley’s (2008) contention of interactive storytelling fostering collaborative team work.

The comments made by the teachers offer insights into possible deep-seated stereotypical perceptions of deaf or hard-of-hearing children and children with disabilities in general. It speaks to the lack of expectations of the deaf or hard-of-hearing children and the lack of understanding of the detrimental effect of inadequate language stimulation and/or limited or lack of amplification on language development. Instead, the assumption appears to be that deaf or hard-of-hearing children have inherent language learning or cognitive difficulties. This supports the urgent calls for pre-service and in-service teacher training highlighted within the local research on deaf and hard-of-hearing children (Furuta, 2001; Furuta & Alwis, 2009; Hettiarachchi et al., 2019).

Limitations

The relatively small sample size of 15 participants necessitates a measured view of the current results. Also, the study was carried out across three different settings, albeit special educational contexts. The extremely limited sample of just three participants from two relatively smaller settings, as well as the use of three settings and four teachers may have influenced the quality of the intervention offered. This may have been further influenced by the limited supervision of the two settings by the researchers due to the distance from the city where the researchers reside to the school/centre, although arguably, this mirrors the proposed service delivery model, following a larger study.

Caution is also required when interpreting the findings due to the lack of inclusion of a comparison group. Additionally, the participants' level of hearing, use of amplification and current mode of communication or language may have also been contributory factors to success. In spite of the above, an overall increase in the understanding and use of a set of target vocabulary was observed across all participants to varying degrees.

With regard to the assessment process, the lack of a formal published standardised assessment of vocabulary is yet another limitation of this study. This is, nevertheless, reflective of the lack of a standardised assessment for receptive and expressive vocabulary in Sri Lankan sign language or Sinhala. That said, the picture-based assessment devised is specific to the vocabulary targeted within the intervention, whereas a standardised assessment is likely to contain more generic vocabulary items.

Conclusion and clinical implications

This multi-sensory children's story approach of "*Katha malu*" delivered via the class teacher daily for three weeks totalling 15 sessions showed positive trends in both receptive and expressive vocabulary gains. Within the backdrop of poor vocabulary skills among deaf and hard-of-hearing children enrolling in pre-school or primary school in Sri Lanka, the findings of the current study are

heartening. Given the current scarcity of adequate speech and language therapists within the education context, this approach has the potential to encourage collaborative inter-professional practice and to fill this current gap in service delivery. A larger-scale study tackling the limitations of this study could strengthen the evidence for the use of whole-class intervention programmes and influence changes in clinical practice. In a follow-up study, it would be useful to include parents as partners of this intervention programme in-line with other early years' language-enrichment programmes (Girolametto et al., 2000; Kelman & Schneider, 1994; Law, 1992). This might also help tackle the lack of involvement of Sri Lankan parents offering language input to their children, particularly using SLSL. Future research could focus on using the approach to encourage the development of narrative skills and the understanding and use of specific syntactic structures both in Sinhala and in SLSL. Further studies that investigate syntactic structures and narrative skills of deaf and hard-of-hearing children must include Deaf first-language users of SLSL as assessors.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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