An investigation into the provision of assistive listening devices for deaf children in mainstream schools

A study submitted in partial fulfilment of the requirements for the degree of Master of Science of the University of Hertfordshire

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Abbreviations

AIC	Auditory Implant Centre
ALD	Assistive Listening Device
CI	Cochlear Implant
CYP	Child/Children and Young People
dB	Decibels
EHCP	Education Health and Care Plan
EY	Early Years
EYFS	Early Years Foundation Stage
FM	Frequency Modulated
FTE	Full Time Equivalent
HA	Hearing Aids
IANL	Indoor Ambient Noise Levels
KS	Key Stage
LA	Local Authority
NDCS	National Deaf Childrens Society
NHSP	Newborn Hearing Screening Programme
QToD	Qualified Teacher of the Deaf
SEND	Special Educational Need and/or Disability
SNR	Signal to Noise Ratio
RT	Reverberation Time

The term ‘deaf’ has been used to represent varying hearing levels from mild to profound. It is also used to include those who identify culturally as Deaf.

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Finally, I would like to thank my husband Scott and sons, Iwan and Lewis for their love and continued support.

Abstract

Deaf children across the UK have access to hearing devices from the NHS, with additional assistive listening devices, such as radio aids, are provided by educational services. Previous studies have taken place investigating the provision of assistive listening devices for deaf children who are below school age, but this study focuses on the provision of assistive listening devices for school aged children; investigating the barriers to provision and the of use of systems by staff and students.

The study was carried out utilising a mixed methods approach, using an online survey to collect both qualitative and quantitative data. 21 respondents answered the survey asking about the provision their local authority delivered. The respondents were all Heads of Service, Educational Audiologists or Qualified Teachers of the Deaf who provide peripatetic support for deaf children. The 21 services represented a total of 11,673 deaf children across the UK and employed 151 Qualified Teachers of the Deaf.

Responses were collated and analysed thematically. The provision for early years children has significantly improved. Provision within schools is good, however the demand is sporadic, as the child matures there is a reduction in uptake of use in later years of school life. Qualitative data collection in the form of open-ended questions allowed participants to explain their provision in further detail, it was reported that all continue to face financial challenges. There was a need for more robust secondary staff training for the effective use of assistive technology and to allow adults to understand the needs of the deaf child.

The study suggested that there are several different funding streams available across educational services. The effective use of assistive listening devices by secondary staff continues to remain a barrier to the older students engaging with the technology, alongside teachers' perceived benefit of the system and the students' lack of autonomy. It is essential that assistive listening systems are used effectively by any person who wears them. The study showed good provision from the services who took part.

1. Introduction

Flexer et al. (2019) coined the phrase, “the ears are the doorway to the brain” they further explain, deafness is a matter associated with the brain, preventing sound from entering. Hearing devices help break these barriers, allowing access to, stimulation and development of auditory neural pathways.

Since the full implementation, in England, of the Newborn Hearing Screening Programme (NHSP) in 2006 (Wood et al., 2015), the ability to identify babies with deafness, soon after they are born, has enabled the fitting of hearing devices from a few weeks of age. This provides most deaf children with the opportunity for early auditory access. This, then in turn triggers access to early support services, such as Qualified Teachers of the Deaf (QToD) who support parents to establish regular use of hearing devices, whilst allowing parents to make informed communication choices amongst other things. Newborn hearing screening programmes set up in both the United Kingdom and the United States, have been established to mitigate delays in management of access to listening and early intervention (Yoshinaga-Itano et al., 2017).

NHSP has been greatly beneficial to the language and educational outcomes of deaf babies and children. However significant delays in language and academic achievement across school age children remain and continue to be reported for deaf children (O’Neill et al., 2014; Holt, 2019; NDCS, 2020, 2021, 2022).

A plethora of evidence suggests that early intervention is beneficial to the language potentials of deaf children however Allen et al. (2017) showed there are a number of factors that influence the impact of these interventions (McLean et al., 2018; Runnion and Gray, 2019; Ching et al., 2018; Ching, 2015). One of the greatest being family involvement (Moeller, 2000; Houston and Bradham, 2011) and the other being maternal academic levels (Yoshinaga-Itano, 2017).

When discussing listening, hearing is in fact a sense and listening is a skill.

> “Hearing is essentially a passive bottom-up driven process; listening is a top-down process that requires attention, many repetitions of stimuli, and tremendous cognitive coordination and effort” Beck and Flexer (2011).

Listening is a learned skill, experiences of which takes place in infancy and is the foundation upon which language, literacy, cognitive and psychological development occur.

The New-born Hearing Screening Programme has enabled children to wear hearing technologies from an early age, with support from professionals being available from identification. Technologies are advancing rapidly for example the age of Cochlear Implantation is around 1 year of age, the implementation of hybrid devices and digital hearing aids with integrated Bluetooth and Phonak Roger.

In recent years, there has been a large emphasis on early provision of Assistive Listening Devices (ALDs) for preschool children, however this study will look at the provision for school age children, in particular the provision across the UK, their similarities and differences and the barriers faced by the local authorities (LAs) preventing deaf children access to the technology. Assistive technologies have advanced with wireless systems becoming common place whilst the size of systems continues to reduce. The capabilities of systems are improving all the time, with multi-functional microphones and superior signal quality being the norm.

The following section will focus on a literature review of research that has previously been carried out, identifying where there are gaps in research. Chapter 3 will explain the methods used to conduct this research study, with Chapter 4 reporting the results from the investigation. Chapter 5 will discuss the findings and conclude with how the results from this project may impact or influence future studies.

2. Literature review

2.1. Assistive listening devices

ALDs have been labelled over the years in different guises. Previously when the system used a frequency modulated (FM) signal, they were called FM systems or Radio Aids. Now that the transmitters use a 2.4GHz digital signal, there has been a move away from the term ‘FM system’; however, it is still widely used. Nowadays, professionals may refer to the systems as personal wireless systems, remote microphone systems, and assistive listening devices amongst other day to day terms of reference.

Modern hearing devices allow the majority deaf people to hear quiet speech when the listening environment is quiet. Unfortunately, in reality, the world is a noisy place, much communication takes place in listening conditions which are not favourable to deaf people and they will struggle to hear against the background noise. ALDs make it easier for deaf people to listen to and concentrate on the sounds or voices they need or want to hear, particularly when there is background noise or other distractions in the environment (NDCS, 2019).

The ALD comprises of two parts, the transmitter or microphone worn by the primary talker and receivers usually worn at ear level on the deaf person’s hearing device. Some of the newest hearing aids and cochlear implants (CIs) have the receiver installed inside the speech processor or hearing aid itself so no external receivers are needed. Some transmitters, such as the Oticon EduMic and Cochlear MiniMic, are connected to the hearing devices using the manufacturer’s preinstalled receivers, again mitigating the need for receivers.

The most widely used systems in UK schools are Phonak’s Roger system. Phonak Roger, is an adaptive digital wireless transmission technology running on the licence free 2.4GHz band. Audio signals are digitised and packaged in short bursts of codes (packets) and broadcast several times at different channels between 2.4000GHz and

2.4835GHz. Frequency hopping between channels, in combination with repeated broadcasts, avoids interference issues. The end-to-end audio delay is well below 25ms and Roger systems are tap-proof unlike older FM systems used. The adaptive frequency hopping that the Phonak Roger employs, means only free channels are used, the Phonak Roger receivers regularly talk back to the transmitting wireless microphones, informing the system about which channels are steadily occupied and which channels are free. The transmitter then automatically ‘hops’ around these occupied channels (Phonak Insight Roger, 2013).

ALDs help to overcome the problem of distance and unwanted background noise. Normally hearing aids and CI speech processors work optimally at a distance of around one metre; however, children are often not within this critical distance from the speaker. Sound energy decays as you move further away from the source, the doubling of the distance from the speaker will result in a decrease in 6dB; this is known as the Inverse Square Law. When a teacher uses the ALD, he/she wears the transmitter and their voice will be detected by the microphone to be sent directly to the child's receivers on or in the hearing aids or CI speech processors. This helps to eliminate some of the efforts of listening through noise or over distance.

2.2. The importance of assistive listening devices for deaf children

2.2.1. Acoustics and background noise

The majority of a child’s day is within school buildings. All new builds and refurbished school buildings have to adhere to Acoustic Performance Standards for Classrooms and Working Environments (DFE, 2015), there are similar standards in the US (ANSI, 2020). The Building Bulletin 93 standards state.

> “The objective is to provide suitable indoor ambient noise levels (IANL) for

a) Clear communication of speech between teacher and student

b) Clear communication between students

c) Learning and study activities” (DFE, 2015)

It is recommended that noise levels in an unoccupied standard classroom should not exceed 35dB in a new build and 40dB in a refurbished classroom, and in teaching spaces for deaf children 30dB and 35dB respectively. However, in an occupied classroom, the noise level will increase in intensity as people are added. The concern is not the overall noise level, but the difference, or ratio between the speech signal of the teacher’s voice and the noise level. It is therefore advantageous to create a positive signal to noise ratio (SNR), where the teacher's voice is louder than the competing noise (Nelson, 2013).

Sound levels greater than 80dB have been recorded in classrooms (Shield and Dockrell, 2004). For children to learn effectively they need to be able to hear and understand what the teacher is saying. Difficulties arise where teachers are continuously competing against background noise levels. Real working environments are seldom quiet and these background noises can mask contextual cues required for recognition of speech (Yang et al., 2012). Deaf students will have greater difficulties understanding speech in noise, compared to their typically hearing peers.

2.2.2. Distance

In most rooms, at distances of two metres or less the inverse square law of acoustic signals applies. This law dictates for every halving or doubling of distance, that the intensity of the acoustic signal would increase or decrease by 6dB respectively (Ross, 1992). Distance is not the only challenge for listening. The inverse square law does not apply in rooms where distances exceed two metres due, to the presence of sound reflections (Mulla, 2011).

2.2.3. Reverberation time

Reverberation time (RT) is the time in seconds for the,

> "Sound energy density in an enclosure to decrease by 60dB after the source emission has stopped" (Building Acoustics, 2009)

The level of reverberation in a room has an effect on the intelligibility of speech (Klatte et al., 2010; Valente et al,. 2012). For teaching spaces, used by students with special hearing or communication needs, the required reverberation time is expressed as the arithmetic average of the reverberation times in 125Hz to 4kHz octave bands, or the arithmetic average of the reverberation times in one-third octave bands from 100Hz to 5kHz (DFE, 2015). Reverberation is caused by sound waves reflecting off surfaces in a room, rather than being absorbed. The increased length of travel time of the wave prior to arriving at the ear of the listener, is heard as smeared sound (see Figure 1). The objective is to provide suitable RTs for:

- Clear communication of speech between teacher and student
- Clear communication between students

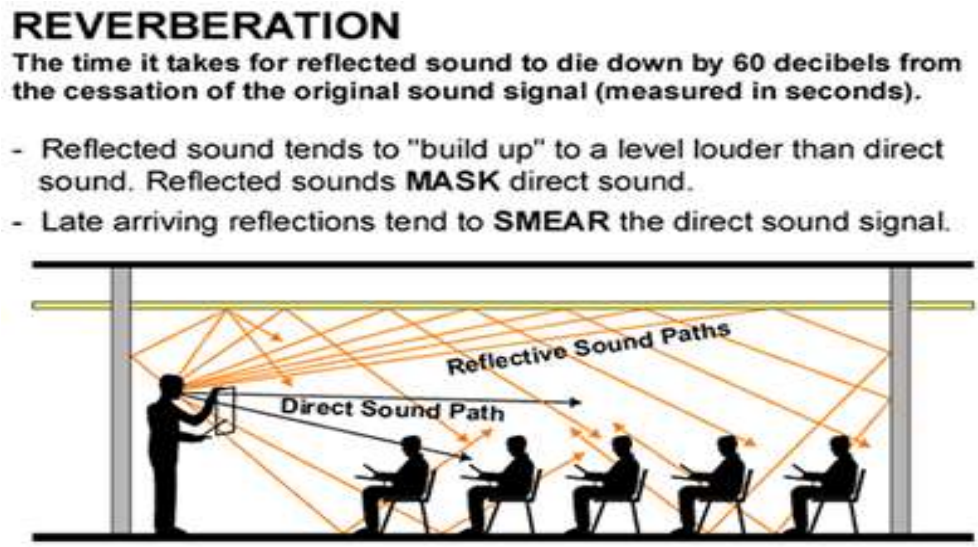


Figure 1: An image to show the effects of reverberation in a room.
Source: reverberation.gif (400×266) (acousticalsurfaces.com)

RT can play a significant part in the speech perception of a young person (Wróblewski et al., 2012, Smaldino and Flexer, 2019). In highly reverberant environments, words may overlap with one another, causing reverberant sound energy to fill in temporal pauses between words and sentences (Bevington, 2016). Moore (2013) observed that some sounds arrive directly, however some sounds are reflected around the room. Some of these lesser reflections arrive slightly behind the original sound, with these sounds in short succession being heard as a single sound. Importantly when the RTs are long, the sounds reflecting around the room remain there for longer, creating an increased noise level, thus reducing the clarity of speech intelligibility.

The acoustic design of schools is essential to enhance speech intelligibility in classrooms (Shield et al., 2015), teaching spaces with lower RTs, were found to produce better classroom behaviours and therefore lower intrusive noises (Klatte, 2010).

The effects of RT and SNR interact, with the combination of both factors affecting speech recognition more than either of the factors alone (Smaldino and Flexer, 2019).

As the background noise increases the less favourable the SNR is, Howard et al. (2010) showed a that greater listening effort was needed in these environments and as a result, fewer cognitive resources were available to complete other tasks.

2.2.4. Listening in noise - Typically hearing children

There are distinct auditory perceptual differences between adults and children. Adults require a lower SNR to listen in noise compared to the younger generations (Howard et al., 2010; Nittrouer et al., 2013). Adults have a mature listening experience and hence have a good comprehension of language. A child's experience of language is not yet fully formed as they are still learning meanings of words and rules of the English language. Beck and Flexer (2011) report that the human auditory brain structure is not fully mature until approximately 15 years of age; thus, a child does not bring a complete neurological system to a listening situation.

Wróblewski et al.'s study showed that speech recognition decreased in reverberant conditions. In addition to this, the study also found the younger the person then the greater was the effect of reverberance on their speech recognition (Wróblewski et al., 2012), therefore supporting the theory that younger children require better acoustic conditions to achieve sentence recognition equivalent to their older peers and adults. The noisy conditions of ordinary classrooms can interfere with learning, even for typical children with normal hearing there is the importance of minimising noise and reverberation in classrooms (Lewis et al., 2014; Wróblewski et al., 2012; Valente et al., 2012).

2.2.5. Listening in noise - Deaf children

Compared to those without deafness, deaf children do not have full auditory access to all of the phonemic and linguistic information hearing children do. When considering the relationship of language and speech-in-noise recognition, the well-recognised fact is that listeners with sensorineural hearing loss recognise speech in noise more poorly than listeners with normal hearing (Nittrouer et al., 2013). Furthermore, Nelson et al.

(2013) found that the individuals listening difficulty generally increased relative to their degree of hearing loss. In fact, it is said that deaf children should have a SNR of at least +20dB because of this increased speech perception difficulty (Smaldino and Flexer, 2019).

The classroom noise levels reported by Shield et al. (2015) show that as the age of the student increases, the classroom noise levels decrease, supporting the need for younger children requiring a higher SNR than older children, due to younger children being educated in noisier environments (Ng et al., 2011). Children have reported that the greatest listening difficulties were hearing their classmates' contributions to class discussions, and when trying to listen to the teacher whilst other students in the classroom were making noise (Nelson et al., 2020).

Listening in noise for deaf children will be particularly challenging when learning new concepts. They will find it harder to fill in the gaps in their learning (Nelson et al., 2013). Some schools have acoustically treated rooms, with panels or coverings that are fitted in the room that aim to affect the absorbance of reflected sounds, with the aim of the treatment being to reduce reverberation times. In Canning and James' report (2012) on the acoustic refurbishment of classrooms, staff reported increased student participation in class, improved understanding, and better behaviour in addition to reduced teacher stress and preferable teaching conditions (Canning and James, 2012).

The effects of reverberation and SNR on deaf hearing aid users, compared to hearing individuals, has been studied by Finitzo-Hieber and Tillman (1978). Table 1 below was taken from their study comparing speech scores in different acoustic conditions. A substantial difference between the two groups was observed, in that as the acoustic conditions deteriorated there was a greater differential effect on the scores of deaf individuals. Furthermore, when reverberation was added to the noise component, the cumulative effect was intensified, leading to scores as low as 11%. A child is not going to succeed if they are only perceiving 11% of the teaching delivered orally.

Table 1: Speech perception scores which compare a group of hearing children and deaf children in different reverberation and SNR environments taken from Finitzo-Hieber and Tillman (1978)

	Normal				Hearing-Impaired			
R time	Quiet	+12	+6	0	Quiet	+12	+6	0
0	95	89	80	60	83	70	60	39
0.4 s	93	83	83	48	74	60	52	28
1.2 s	77	69	69	30	45	41	27	11

From these combined factors of distance, noise and reverberation, in addition to the individual's damaged auditory-linguistic system, it is clear to see why solely a hearing device is unlikely to result in satisfactory communication in the classroom (Smaldino and Flexer, 2019).

A deaf child's ability to learn incidentally is greatly impaired, although amazingly, very young children learn approximately 90% of the information they acquire incidentally. Deaf children have a reduced incidental learning potential because they cannot receive and perceive intelligible speech over distances. Beck and Flexor (2011) suggest that a deaf child's ability to hear over distance must be extended, as much as possible, through hearing access technologies.

2.3. Reported benefits of assistive listening devices

Remote microphones are commonly used in educational settings, where large classroom sizes, large numbers of competing audio sources, distance of the listener from the teacher, and often poor acoustics all contribute to the potential for degraded intelligibility (Stone et al., 2022). The ALD transmits the speech signal directly to receivers on the child's hearing technology, thus reducing the effects of background noise, reverberation and improving the listening experience of the learner.

Many studies have shown the benefits of improved speech recognition using an ALD. Dammeyer et al. (2017) found those students who had accessed ALDs, including

notetakers and interpreters, achieved higher scores academically. Mulla (2011) adds that, as well as improved speech perception, the listening effort is reduced leading to improved concentration and attention. Willis (2018) reported that CI users exhibit increased listening effort levels, even in optimal listening conditions of quiet. Furthermore, Holman (2019) investigated experiences of daily life fatigue in the real world of deaf adults, fatigue was reported, both cognitive and physical effort for some but not all hearing aid (HA) users. Because children with hearing loss may have to allocate a greater degree of their limited pool of cognitive resources to listening tasks, fewer of these resources are left available for other processes, such as taking notes and interpreting new information. This means that deaf children may fall behind in classroom discussions, or miss important information, while they are trying to understand what they are hearing (McCreery, 2015).

When Nelson et al. (2013) explored pre-school teachers' perceptions of using ALDs, the results showed that ALDs were advantageous in improving SNR across a variety of environments. There were reports of improved child outcomes in many areas including academic performance, speech and language development, behaviour, and attention. In Webster's study (2015) the parents perceptions to the benefit of ALDs was wholly positive, and they noted better responses from their children particularly in noise and at a distance. There is strong evidence to support the benefit of ALDs for preschool children (Cooper and Statham, 2017; Mulla, 2011; Allen et al., 2017; Mulla and McCracken, 2014).

2.4. Gaps in research

Much of the research has scrutinised the provision and demonstrated the benefit of ALDs for children of preschool age. There are also studies examining possible reasons for the reluctance of teenagers to engage with technology. To this author's knowledge there has been little investigation of the provision of ALDs to school aged children.

When Miranda (2018) analysed the facilitators and barriers to FM use for school age children, it was found that the teacher's knowledge of the system was one of the main barriers preventing use of the system, it may also be beneficial to investigate whether there are other barriers.

There is little doubt that ALDs help combat some of the negative effects of noise and distance on listening and learning language. However, the question remains whether all deaf children are given equal access to this provision.

In 2020, the National Deaf Childrens' Society (NDCS) requested a Freedom of Information to all local authorities (LAs) concerning the provision of ALDs to children under five years of age, there has not been a similar request recently for the provision for children over five years other than the annual CRIDE reports, which does not delve into sufficient detail.

2.5. Conclusions of the literature review & aims of this research

The aim of this literature review was to determine the underlying concepts of this study and to investigate the provision and use of ALDs in LA peripatetic support services for school aged children. The review of the existing literature has reinforced the need for more exploration into the provision, and barriers to provision, of ALDs to children of school age.

3. Methodology

3.1. Introduction

A mixed methods approach was used to investigate the provision of ALDs to deaf children in mainstream schools. The methods used to collect data included both quantitative and qualitative approaches. The combination of both forms of data provides a stronger understanding of the problem or question than either research method in isolation (Cresswell, 2014).

The methodology related to ethics, design, recruitment of participants and overall procedure will be discussed within this chapter.

3.2. Ethics

Ethics forms were completed and submitted to the Social Sciences, Arts and Humanities ECDA, University of Hertfordshire (Appendix I) following BERA (2018) guidelines, approval was granted (Appendix II).

To use a survey as part of a research project the University of Hertfordshire's ethics approval required that 'JISC Online Surveys' was used. In accordance with the data privacy guidelines of the University of Hertfordshire (University of Hertfordshire, 2021), this was the only method of online data collection compliant with the requirements of privacy guidelines. Furthermore, it was stipulated that implied consent was no longer considered 'good practice' and should not be used for participation in the online questionnaire. Therefore, an explicit question asking for consent was essential at the beginning of the survey. Advice received was that a participants information sheet (EC6) need not be shared with candidates if the information was included within the survey. A copy of the distributed survey can be seen in Appendix III.

Participants were asked which LA they are employed by this was purely to assist comparisons and has been anonymised in all research findings. All further information has been anonymised and has been stored securely on the researcher's university One Drive cloud storage system. No hard copy data will be kept.

3.3. Design

Thomas (2013) suggests the design approach should be led by the research inquiry, rather than the researcher be strictly led by the design approach he states.

> *"Your research approach should be the servant of your research questions, not its master."* (Thomas, 2013, 7 p. 116)

As previously stated a mixed methods approach was utilised in this study, the project is designed to investigate the provision of ALDs in Local Authorities (LAs) across the UK. In order to be able to make a comparison of provision, the views and information from LAs will be collected by surveying Heads of Service, Educational Audiologists and Qualified Teachers of the Deaf working in peripatetic services. Collection of data will be in the form of an online survey; data will be analysed from the survey to identify patterns and objectively evaluate provision of ALDs in order to create a summary of responses. The initial questions in the survey will collect quantitive data, with open ended questions eliciting qualitative data to complementing former methods.

3.4. Data collection

Potential participants were contacted using a non-probability purposive sample to achieve representativeness and enable comparisons to be made. Despite being unrepresentative of the whole population and possibly demonstrating a bias, this sample method enabled access to those who have greater knowledge in the field of

study (Cohen, 2017). To increase what is already an expected low response rate for online surveys (Miller and Dietsch, 2011), an element of the non-probability snowball sampling approach was introduced (Dudovskiy, 2015; Newby, 2014). Therefore, within the invitation email, the researcher explicitly asked participants to distribute the survey onwards to other professionals who may be interested in taking part.

The questionnaire completion time was estimated at 10-15 minutes, care was taken to recognise the impact of participation on the workload of the individual (BERA, 2018).

3.5. Recruitment of participants

Professionals were invited via email invitation; they were contacted through professional forums; the British Association of Educational Audiologists (BAEA) and the Heads of Sensory Services (HoSS) forums and finally as a recent graduate of the University of Hertfordshire's Educational Audiology course the researcher utilised personal contacts. The only requirement of the study was that the professional worked within a peripatetic service, this was to enable comparison between regions. The budget systems in a specialist school for deaf children are very different to what is provided by a LA peripatetic service, a special school will have greater control of their own budget which would be non-comparable and have added factors beyond the scale of this study.

3.6. Questionnaires

Data was collected using JISC online survey builder. A questionnaire is a versatile instrument for collecting survey information, it provides structured, often numerical data and is able to be administered without the presence of the researcher. However, these positives need to be counterbalanced by the time taken to develop, pilot and refine the questionnaire (Cohen et al., 2007). Care was taken with the length of the questionnaire,

shorter questionnaires have higher response rates (Deutskens et al., 2004). In addition, to support higher numbers of participation a follow up email was sent to remind participants of the closure date of the survey (Deutskens et al., 2004). Time completion was an important factor that was taken into account. It was acknowledged that there will be a time-based intrusion into the participants life, in addition to a level of sensitivity or invasion of privacy. Completing the survey was wholly down to the choice of the individual, as they cannot be forced into completing the survey although were strongly encouraged (Cohen et al., 2017). Questionnaires have the benefit of the participant remaining anonymous; however, some may find this impersonal compared to face-to-face interviews (Atkins and Wallace, 2012).

The inviting email was sent to participants with a covering letter, its purpose was to indicate the aim of the author's research, the importance of the study, to assure participants of confidentiality, and to encourage their replies, it is considered good practice to do such a thing (Walliman, 2006).

3.6.1. Questions and ordering

Initial questions used in the survey were to draw out information. Questions used were dichotomous questions and multiple-choice answers; the former quantitive responses compel respondents to commit to an issue, they provide a clear, unequivocal responses. Like dichotomous questions, multiple choice questions can be quickly coded and quickly aggregated to give frequencies of response (Cohen et al., 2017).

Questions at the start of the survey asked for the participants job title with the option to add more information should it be necessary. The author asked participants to disclose the LA that they worked in, this allowed the study to report the geographical representation of data whilst still remaining anonymous.

A small sample size allows for a less structured and a more open questionnaire to be designed, many of the questions used later in the survey enabled participants to write a free account in their own terms, inviting honest, personal comment to explain and

qualify responses and therefore avoid the limitations of pre-set categories of response (Cohen et al., 2017). The open-ended question is a very attractive device for smaller scale research, it adds richness to the response to a closed question, giving the respondent the opportunity to offer their own perspective, it also provides qualitative data. Newby (2017) notes that direct quotes from respondents can offer insights not easily gained otherwise.

The structure and order of questions were considered in the design of the survey. Care was taken to avoid leading questions, that is, suggesting to respondents that there is only one acceptable answer, and that other responses might or might not gain approval or disapproval respectively; this method of survey would risk triggering the Experimenter Effect (McCambridge et al., 2013; Thomas, 2013). The respondent was able to cease the completion of the survey at any point in the process, consideration to the order of the questions was taken, encouraging higher completion rates (Dillman et al., 2014; Ary et al., 2014; Newby, 2014). Therefore, easier questions of high interest were towards the start prior to the author introducing more difficult open-ended questions towards the end, in order for the respondents commitment to be engaged continually throughout (Artino, 2014).

3.6.2. Online surveys

Surveys may be paper based, postal surveys, or more recently email and online surveys are used. An example of a popular online survey is Survey Monkey however this does not meet the privacy requirements stipulated by the University of Hertfordshire.

Neither a postal survey nor paper-based survey was considered for use in this study, for the reason that online surveys are fast and cheap to administer, they reduce human error in data entry, and if designed well provide fast consistent collection of results (Cohen et al., 2017). In fact, the online method of collecting data enables participants to participate asynchronously and at a convenient time to their other commitments (Evans

and Mathur, 2005). It is important that the respondents freely participated in the study to ensure ethical compliance (BERA, 2018).

3.6.3. Validation

A draft of the survey was piloted by two colleagues working as peripatetic QToDs and Educational Audiologists in LA services. The invitation email contained the link to the JISC online survey as it would for the official dissemination to the targeted audience. The pilot was to ensure that the questionnaire was unambiguous in its interpretation, as once the survey has been officially distributed, it is out of the researchers' control (Dillman et al., 2014 and Artino et al., 2014).

3.7. Distribution

The success of a survey can be dependent on the response rate, and to maximise this, there are trends for completion based on the day and time of distribution. Although this survey was emailed to professionals, who would mainly access it on laptops or desktops, it would have also been accessible on mobile devices which are accessible beyond the hours of the working day. Des George (2021) found survey responses start at 7am, increasing through the morning, they reduce over lunch and generally peak at 2pm, this pattern continues over the week (see Figure 2). With this in mind the author distributed the survey via email on a Wednesday morning allowing willing participants the opportunity to complete the survey during the morning before numbers ebbed around lunchtime.

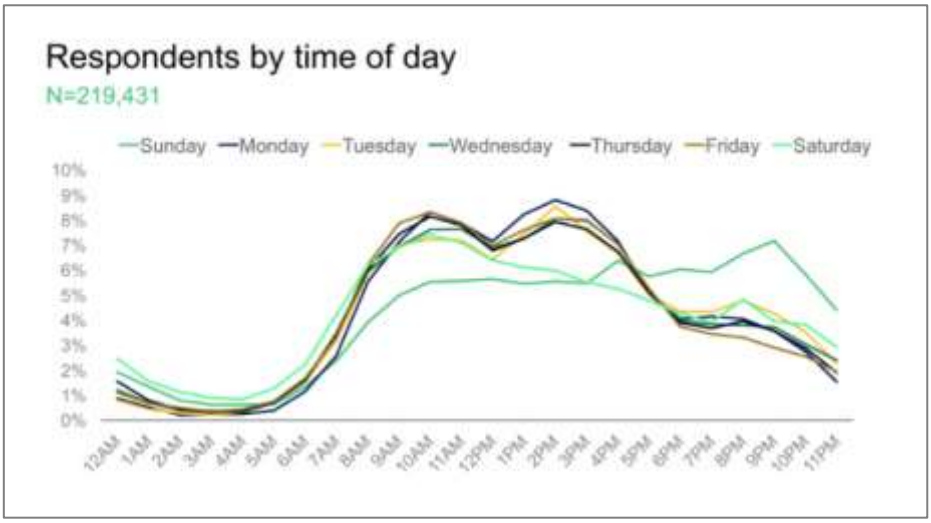


Figure 2: A graph to show times for survey responses (Des Georges, 2021)

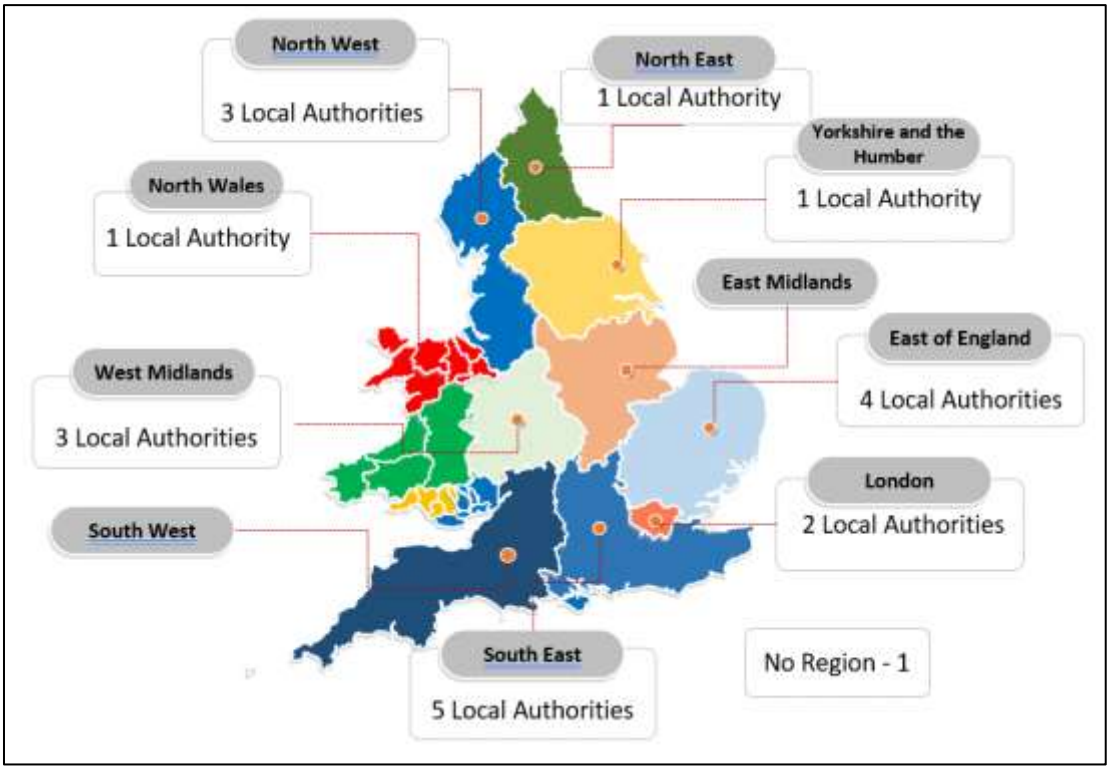
3.8. Reliability and validity

As more and more questionnaires are conducted online, the issue of integrity is highlighted (Cohn et al., 2017). The lack of control presents a serious issue for researchers, including knowing who is completing the online survey (Williams, 2012). This survey was confidential, the participant was asked for their name and contact details, which could be seen by the author however this was optional and the participant could remain anonymous if they wished, with this in mind the author hoped it would encourage a greater degree of honesty from participants.

With every single method of data collection and design method there is a level of bias (Creswell, 2014). Additionally, researchers themselves have their own positionality that can affect the interpretation of results (Thomas, 2013). There may be limitations to this study due to the Hawthorne effect (Thomas, 2013; Cohen et al., 2017), hopefully these will be mitigated to a degree with participants responding voluntarily to the survey in a remote manner therefore not in the presence of the researcher.

3.9. Participants

The survey was circulated amongst three professional forums inviting participants working in peripatetic services to take part in a short survey, Figure 3 shows the geographical distribution of responses.



(Map created using http://yourfreetemplates.com)

Figure 3: Distribution of survey responses by region across England and Wales.

In total, there were 21 respondents, 19 from England, one from Wales and an anonymous participant. Of the nine English regions no responses were received from the South West of England or the East Midlands, surveys were distributed online via the Heads of Sensory Services Forum (279 members), the British Association of Educational Audiologists forum (76 members) and another Educational Audiologist group (10 members). There will have been some members who are on multiple forums therefore some overlap will have occurred and many professionals on these forums will

also be working in roles outside peripatetic services; therefore, not eligible to take part in the survey. Numbers reported in the CRIDE 2021 England survey (CRIDE, 2021) show there are 113 LA based services for deaf children in England, 20 English services replied to this study totalling 18% of all English peripatetic services. Table 2 displays the quantitive survey data related to regional responses, the total number of deaf children on regional caseloads and the number of QToDs employed by the regional services.

Table 2: Table to show caseload number and Qualified Teachers of the Deaf (FTE)
*** This data only responds to one service in this region**

Region	No. Services who responded	No. of children on caseload	QToD (FTE)
North West	3	1253	24
North East	1	1200	5.6
Yorkshire and the Humber	1	1200	11.6
West Midlands	3	971	13.6
East Midlands	0	-	-
North Wales	1	300	3.4
East of England	4	2067	35.6
London	2	200*	7.5*
South West	0	-	-
South East	5	3382	44.2
No Region	1	1100	5.5
Total	21	11673	151

3.10. Response rates

In total there were 21 respondents to the survey. As previously stated, when distributing the survey there would have been professionals receiving up to three requests to participate, the raw response rate was 21 responses out of a possible 365 email invites.

Without any duplicates of invites this represents a response rate of 6%. A completion rate of 10% is to be expected for postal surveys (Dillman et al., 2014), but response rates for internet surveys are typically similar or lower than that of a paper-based surveys (Sexton et al., 2011; Creswell, 2014). However, the response rate of this study is lower than the postal rate therefore tying in with previous findings from these authors.

Securing a sufficiently high response rate to give credibility and reliability to the data is challenging. In this study, the author decided to circulate the survey to as many members of the purposive sample as possible, rather than limit numbers by identifying a representative sample. Follow up emails were sent prompting completion of the survey ensuring non-respondents were reminded of the study. Fowler (2009) indicates that between a quarter and a third of people may agree to complete a survey if a follow-up is undertaken.

3.11. Data analysis

The questionnaire yielded both qualitative and quantitative data. Themes identified from the qualitative data were supported by the quantitative data, adding an additional layer of rigidity. Since the findings from qualitative research specifically focus on interpretation of data, rather than on “objective” measurement, it is not uncommon for qualitative research to be perceived as lacking in rigor.

Qualitative research allows for the gathering of quotes from participants providing information on the hows and whys of human interactions and experiences that must take place in a particular context, and why it matters (Patton, 2015). A key benefit of this type of research, in the context of this study, is that it can uncover important factors in barriers to the provision of ALDs which can then be investigated in a more structured way (Tracy, 2019).

Qualitative analysis transforms data into findings, Patton (2015) explains, the challenge of this method is that no formula exists for this transformation, each analytical approach used will be unique to the researcher.

Thematic analysis is a qualitative research method that can be widely used across a range of research questions. It is a method for identifying, analysing, organising, describing, and reporting themes found within a data set. The thematic analysis of data

provides a highly flexible approach that can be modified for the needs of many studies, providing a rich and detailed, account of data.

Whilst thematic analysis is flexible, this flexibility can lead to inconsistency and a lack of coherence when developing themes derived from the research data. Consistency and cohesion can be promoted by applying and making explicit an epistemological position that can coherently support the study's empirical claims (Nowell et al., 2017).

The study also collected quantitative data to be analysed, with this approach, the researcher is working along the lines of logic established by the study design rather than reacting to what happens along the way. Bell (2017) describes quantitative research as collecting facts and studying the relationship between them. This type of inquiry relies on numerical data and questions that are structured and pre-determined. Researchers attempt to study a 'sample' of the population, that sample would be representative of a larger population and give the results of the study a predictive value. This type of research is more complex to undertake and so often more costly. It requires that the researcher is able to control variables. For these reasons, it is not the major form of research within education.

The task of the researcher is to identify the most appropriate research approach for answering the question of interest (File, 2016). No approach prescribes or automatically rejects a particular method of data collection (Bell, 2017). It is for this reason a mixed methods approach was chosen to best support the research question.

The twenty-one completed questionnaires were examined and analysed using the JISC Online Surveys software and are discussed in detail within Chapter 4.

3.12. Reflexivity

Whilst the purpose of the researcher is to be neutral, it is likely that the author's principles will have informed the decision to research this subject. As a QToD the author

will utilise conceptual tools from several sources (Denscombe, 2014). Cohen et al. (2017) reported researchers are in the world and of the world that they research, the author realises that an unconscious bias may exist. As an Educational Audiologist and QToD working peripatetically in a LA service the author is the world that she is researching, whilst working in a paradigm promoting access to language, listening and making maximal use of assistive listening technology, the investigation to identify the barriers to ALD provision and ALD use in schools could support changes in future practice.

4. Results

This study aimed to collect a sample of LA services' provision of ALDs for school age children. The following chapter contains an analysis of the responses collected from professionals working in peripatetic services for deaf children through an online survey.

Quantitive responses from the survey in sections 4.1 to 4.4 examine school provision, use at home, systems used by the LAs and the eligibility criteria applied. In section 4.5 there is a qualitative analysis of feedback from the surveys with section 4.6 providing a summary of the key findings.

4.1. School age provision

20 respondents answered the questions about ALD provision to different age groups. The non-respondent reported they did not know the information to the questions asked. Of the 20 responses, 100% of these services offer ALDs to all ages of children; from Early Years to Post 16. When drilling down for specific numbers of ALD systems in use for each age bracket the number of respondents reduced to 17. Reasons for this reduction may have been because the respondent's data was not recorded in a format compatible with the questions asked, or the information wasn't available/accessible at the time of completing the survey. To get a clearer breakdown of numbers the researcher re-contacted two services of those two services, one responded, increasing the total number of responses to 18. Table 3 shows the number of ALDs used by regional services in the surveyed age categories. Despite the service offer of ALDs to families and schools, there is not always the uptake of the provision and numbers may appear lower than expected. These numbers should be taken with caution and certainly not compared regionally owing to not all UK services being represented; this is only a small sample of provision and therefore not a complete picture. What we can compare is the total number of systems in use across the different ages categories.

Table 3: Number of ALD systems used in age bands within regional areas

Region	EYFS	KS 1	KS 2	KS 3 + 4	Post 16
North West	25	39	62	84	13
North East	31	15	57	74	71
W. Midlands	20	53	74	75	20
North Wales	2	9	15	26	3
East of England	54	145	269	196	43
London	4	10	10	10	3
South East	19	76	169	183	46
No region	32	34	29	42	15
Total	187	381	685	690	214

Despite the numbers being low for Early Years (EY) children, this is a positive increase in what has historically been an age group who have had limited provision. Four years ago, the CRIDE Survey (2018) reported that 56% of UK services provide families of pre-school deaf children with radio aids to use at home and 81% provide devices for use in early years settings. In this study, 100% of the 20 participants said that their service provides ALDs for this age range for use at both home and school.

The increase of systems in use across the ages is not proportionate, considering the number of year groups in each age category or Key Stage (KS). Figure 4 is a graph to show the ALDs in use compared to the number of groups in each age category. The X-axis displays two sets of data, the left-hand side shows the groups in each age range (blue bars) and on the right hand side the number of ALDs in use (red line). In the Early Years age range, this includes Nursery and Reception classes, therefore two groups. Key Stage 1 consists of Year 1 and Year 2 classes, again two groups, Key stage 2 includes Year 3, Year 4, Year 5 and Year 6 classes, a total of four groups. In secondary schools KS 3 and 4 consist of five groups; Year 7, Year 8, Year 9, Year 10, and Year 11, and finally Post-16 has two groups, Year 12 and Year 13.

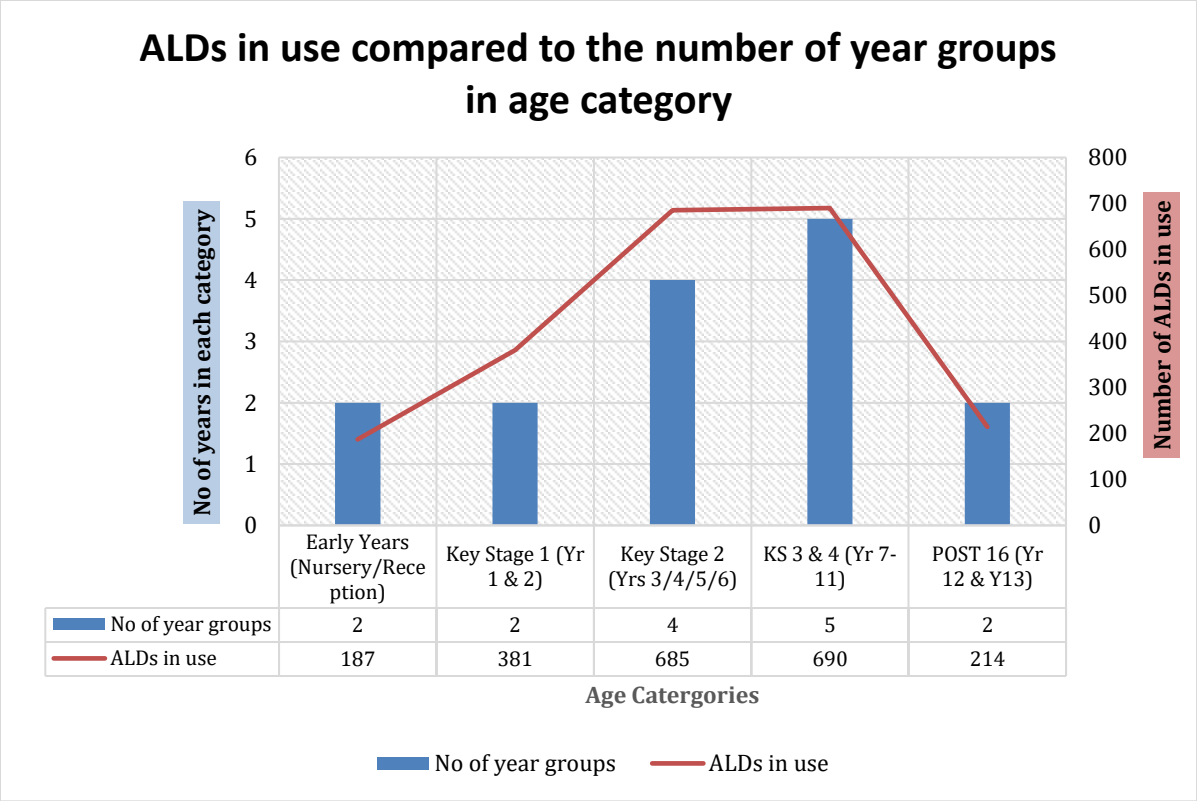


Figure 4: A graph to show the ALD numbers compared to the numbers of year groups in each educational category.

Compared to EY, there are over double the systems in use in KS1, both EY and KS1 have the same number of year groups, two. When looking at KS2 the numbers do not mirror the previous age group, the numbers do increase but it would be expected to be double the number of systems reported for KS1 as there are double the number of year groups. KS3 and KS4 have a total of five year groups, there is a slight increase in numbers compared to the previous age category, but the number of systems does not increase exponentially. It is to be expected that the Post 16 numbers reduce proportionally, and they have therefore been compared to other categories with two year groups, such as EY and KS1. The number of ALDs in use at Post 16 are greater than EY but less than KS1, with a total of 214 systems in use.

Based on the data collected, Figure 5 shows 49%, almost half, of the ALD provision is to children at primary school age (KS 1 and KS2), if EY data is included the numbers increase to 58%, however it is not known if the EY data includes children who do not

attending nursery. The numbers of ALDs being used across the secondary age range reduce in number compared to the primary age range and by the time they reach post-16 the numbers fall dramatically to 10% of the overall provision.

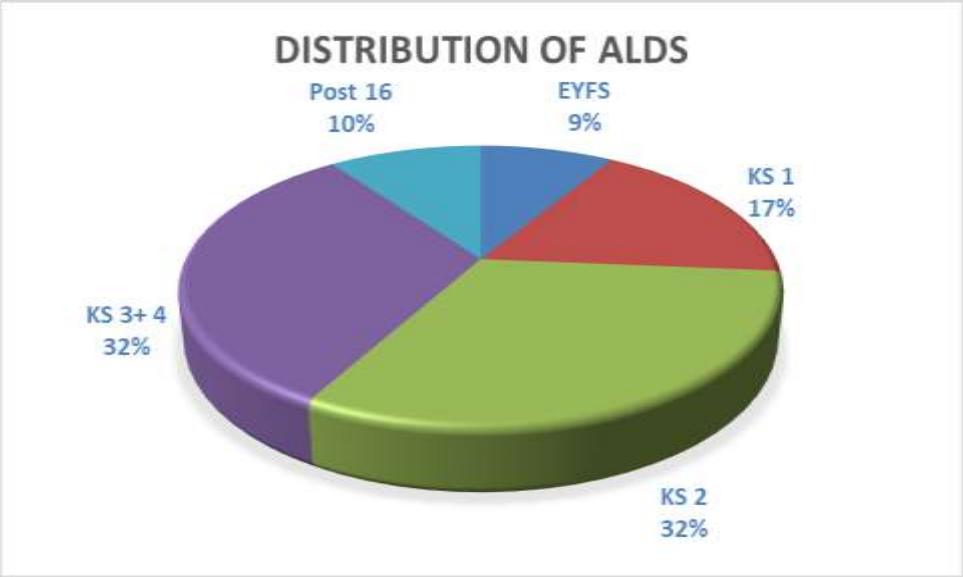


Figure 5: ALD provision across the different ages – Based on 18 respondents

4.2. Home use

4.2.1. General provision

All services surveyed offer the use of ALDs outside of school hours, however, not all families accept this offer and in fact the uptake is variable, it is very much dependent on the leisure activities of the child/young person (CYP) and whether the family see it as a beneficial tool for their child. This would question how informed the families are of the benefits of radio aids at home.

> Participant 6 (P6): *"We start encouraging it for home use during pre-school years, so it's not just seen as being needed for school only."*

P13 has been allowing equipment to be used at home for over two years, however they report,

> "*Not many choose to take them home.*"

Replacement of lost or broken equipment is a drain on resources.

> P18: "[A barrier preventing DCYP accessing ALDs is] the cost of equipment and management of loss."

Although not explicitly asked, four services reported having loan agreements with schools and families. Many responses stipulated consideration for home use is often on a case-by-case basis ensuring where possible effective and proper use of equipment. To guarantee this P21 reported that their service:

> "Made home visits to set these up."

P18 explained that:

> "A training/meeting session with the TOD [takes place], to go through use and function [of the ALD]".

P7 indicated that:

> "Any family wishing to use [an ALD] at home can."

4.2.2. Challenges to provision between service and parent

Local authority Services for deaf children have different funding streams for EY children versus school age children making the provision for home use more complicated, but not impossible. Agreements for ALD home use have been put into place by some services, this is dependent on who owns or is financially responsible for the system, P1 explains that systems used by EY pupils can be used in the home but for school age children a home/school agreement must be in place, this is due to funding differences, in this context the school are financially responsible for the equipment. P15's explains

> "*The circumstances are reviewed for the individual but generally if the equipment is leased from us then it must stay in the setting. However, some settings have bought the equipment outright and it is therefore at their discretion as to whether they allow it to go home. We also have several families who own their own [ALD] and therefore take it to and from school as they see fit*."

The individual family circumstances are a consideration for use at home, some services like P3, require an agreement to be in place for school age children, P11 stipulates it:

> "D*epends on circumstance and need…providing the ToD is also in agreement."*

P6 will allow the systems home:

> "*For clubs and activities during term-time. [It is] only allowed home if system is actually going to be used…[We] do not ask families to put it on their insurance at all unless they want to use it over the 6 weeks summer break.*"

Some provisions stipulate that the system must be insured for use at home and others only if the system is to be used over the summer holidays. There are services that do not require insurance to be purchased, showing variation in provision.

4.2.3. ALD purpose of use

The purpose of ALD use in non-educational settings is variable. Despite all services offering this opportunity, four services mentioned there is limited uptake and five services allow it if the parents make a request, P20 stated that

> "*All age groups are given the opportunity to use [ALDs] at home however the uptake is variable*."

In contrast P21 explained that their pupils use ALDS for a variety of reasons

> "*They use them for safety (parents), all media - tv, computers, laptops, tablets, gaming and telephone etc.*"

P2 reported that

> "*The pupils could use their ALDs during the Covid-19 pandemic lockdown periods, when schools were closed, or year groups were being educated remotely*."

This survey did not explicitly differentiate between the age of the CYP and the purpose of use of ALDs at home, therefore responses have not specifically been indicated related to age. The question was posed as a closed subset; therefore, no quantitative data was able to be extrapolated.

4.3. Systems in use

There are two types of devices that are generally in use, proprietary wireless options which are available for nearly every hearing technology manufacturer's device or universal systems such as Phonak Roger. The type of ALD used is guided by the Auditory Implant Centres (AICs) or the NHS Health Trust as to which manufacturers hearing device is provided.

Phonak Roger ALDs using the 2.4GHz signal, have been available since 2013 (Phonak, 2013), the survey results shown below in Figure 6, show that 100% of respondents use Phonak Roger systems using the 2.4GHz signal, however, there continue to be a few of the older FM systems in use with children. From the survey responses, it highlights that the Phonak Roger system is the most popular with services who support deaf children. It is the most versatile ALDs in terms of allowing multiple deaf CYP to use it. Although all services use the Phonak Roger systems, it is positive to see that other manufacturers' systems are also in use. The use of the Oticon EduMic is increasing, 66.7%, over half of the respondents use this microphone.

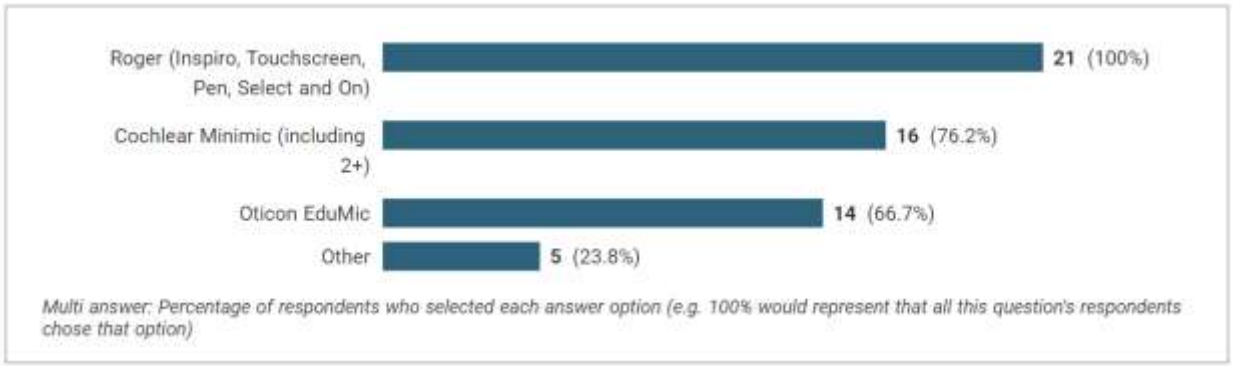


Figure 6: Types of ALD systems used by peripatetic services surveyed

4.4. Eligibility criteria

The NDCS in collaboration with the FM Working group published Quality Standards for the Use of Personal Radio Aids (NDCS, 2016). It is stipulated that,

> *"Every deaf child should be considered as a potential candidate for provision with a personal radio aid…"*
>
> (NDCS, 2016, p.11 Quality Standard 1)

Responses from the survey are shown in Figure 7, illustrating the eligibility criteria. Of the 21 participants, 19 responses indicated that QS1 was one of their criteria in conjunction with other criteria. Participants were able to select multiple criteria that their service apply before the allocation of an ALD.

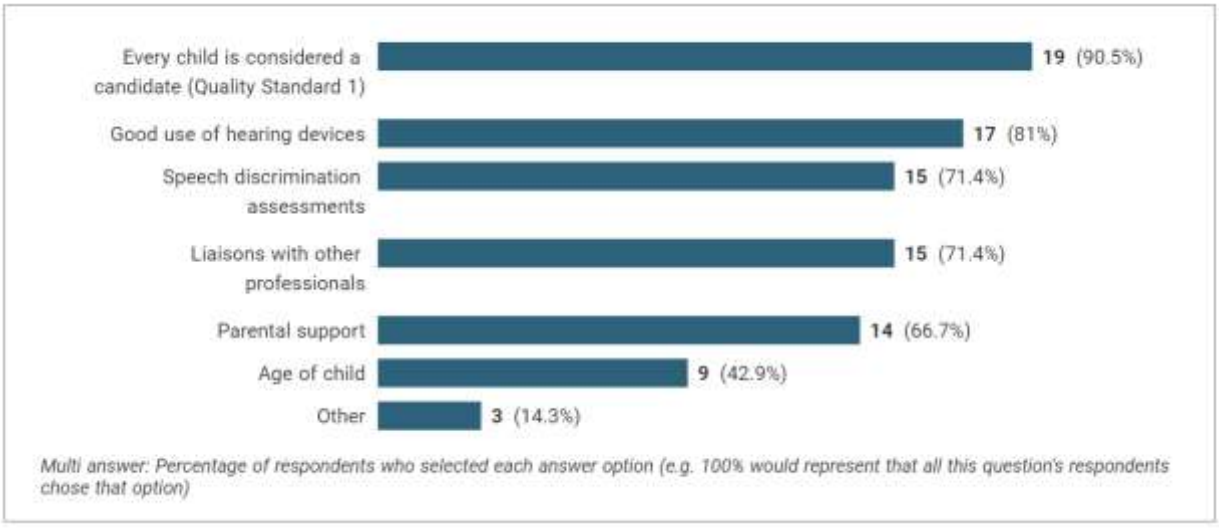


Figure 7: Eligibility criteria for allocation of an ALD system

81% of services believe the consistent use of hearing devices is vital if additional technology is going to be used, although this goes hand in hand with parental support. 66.7% of services value the support of parents, this may be lower accounting for a reduced uptake of home use as mentioned in Section 4.4. This research study is aimed

at professionals and gathering their views; it does not capture parental views. Allen et al. (2017) studied the parental acceptance of technology for EY children, which found that parents realised technology was easier to accept and use than first expected. Some services work with parents to train them to use the technology effectively, one would question if all services employed this strategy, whether there be a greater demand.

Nearly three quarters of respondents (71.4%), use speech discrimination assessments as criteria for allocation. Participants were able to expand on their responses relating to the eligibility criteria. P17 reported that a trial of a system may take place with some candidates, part of this trial would be with "*assessments/observations before and after*," this service also utilises speech discrimination assessment as part of their eligibility criteria.

In addition, P8 noted that with regards to CI users they would expect a child to have

> "*Achieved competency on the FM training tool*,"

this enables the CYP to report any faults with sound quality.

4.5. Barriers to services providing ALDs

From analysing the survey responses, a thematic pattern developed to the question "What is the main barrier in preventing more CYP using ALDs?" each will be discussed individually in more detail below, the themes were:

1) Funding
2) Educational Setting - Staff use
3) Educational Setting - Pupil choice

4.5.1. Funding

Audiology equipment budgets vary greatly, only 60% of survey responses said they have a specific budget that ALDs are purchased from, however 25% indicated “other,” demonstrating that there are other methods of sourcing funds for ALDs.

> *P14: “We have a general budget for all SEND equipment that is used to purchase ALDs across our service, further education and resources bases.”*

Some services ask the schools to part fund the cost of equipment.

> *P1: “The school pay the first £1000 from their budget and the rest is subsidised from the Individual Pupil Needs budget.”*

Others must apply for each CYP.

> P17: “[We] *have to make the case for need of equipment, [we] sometimes get it, sometimes don’t.*”

15% of respondents do not have an audiology budget for the purchase of ALDs, one response reported that their budget is based on pupil numbers. Table 4 shows other funding challenges reported by respondents including the increasing price of equipment, initially this is a drain on the budget, but argued by another participant that the systems can be transferred between CYP. As previously reported in Section 4.2.1, funding the loss of equipment can present a barrier to provision, some services report purchasing insurance, but the majority (90.5%) do not and absorb the costs for equipment loss and damage.

Table 4: Table to show other responses to barriers related specifically to funding.

Participant	In your opinion, what is the main barrier in preventing more deaf pupils using ALDs?
P1	Lack of central funding.
P5	Lack of joint commissioning of equipment between Health and Education, cost of some manufacturers ALDs
P9	Less of an impact with the roll out of Marvel [hearing aids]
P13	Increasing demand on our budget and rising cost of equipment! QS1 is at the forefront of our mind however due to budget demands we would not be able to offer all 718 children on the case list an ALD.
P14	That ALDs are not issued by health as an integral part of the amplification fitting process.
P16	Non compatibility of hearing devices with just one ALD system, hence equipment [is]more expensive and less transferable between CYP.
P19	No barrier although funding could be an issue on wait time

Interestingly *P15 reports,*

> "*Settings are expected to lease or buy [ALDs]",*

some services do this on an annual basis or ask schools to pay in full using funds from the Notional Budget given to the school for each CYP with Special Educational Needs and or Disability (SEND). Responses demonstrate that there are a variety of styles of commissioning for the technology used by deaf CYP.

Respondents commented on the need for joint commissioning with the health authorities, with the newer hearing devices on the market this is happening to a degree, P6 wrote

> *"We are also considering moving onto Oticon aids so that Education purchase the transmitter* and Audiology purchase the aids."

As mentioned by P9 in Table 4 new hearing aids are minimising barriers.

4.5.2. Educational settings – Staff use

The demands placed on peripatetic services to train, support and monitor schools was identified as a barrier to the provision of ALDs. P10 in Table 5 reiterated that there is a need for more resources to support settings.

> P17*: "there are cases where there is not a support structure in place, if we provided more ALDs this would have a significant impact on our caseloads and capacity to monitor equipment etc."*

As indicated by both P3 and P4 in Table 5 the success or barrier to ALD use can be determined by the attitude of the school. Often there is a lack of understanding and effective use of systems. P15 in Table 5 reported that secondary aged children have several adults using their transmitter which presents significant barriers to the uptake of use. Furthermore, young children are comfortable with the systems but this engagement decreases as the child gets older (P15).

These barriers have also been reported by other researchers in that some teachers lack the understanding of deaf CYP communication requirements (Salter et al., 2017 and McCracken et al., 2012).

Table 5: Table to show responses related to barriers for older pupils and staff use

Participant	In your opinion, what is the main barrier in preventing more deaf pupils using ALDs?
P4	Lack of understanding and effective use of systems in secondary schools.
P3	Attitude of school to make it successful.
P10	Need more ToDs and/or specialist HI practitioners to support pupils and staff in mainstream with use of equipment.
P15	In the early years and primary years, the CYP appear to be quite comfortable with the ALDs. The issues occur once they move into the upper key stages.
P16	Pupil choice (older students more likely to stop using). This is based on their experience of how teachers use the ALDs. Less effective use of transmitters by teacher in secondary schools.
P17	There are cases where there is not a support structure in place, if we provided more ALDs this would have a significant impact on our caseloads and capacity to monitor equipment etc.

4.5.3. Educational settings – Pupil choice

From the responses related to barriers for older pupils, Table 6 shows the reported reasons that pupils chose not to use ALDs or why the secondary numbers were reduced.

Table 6: Table to show responses related to barriers for older pupils not using ALD systems

Participant	In your opinion, what is the main barrier in preventing more deaf pupils using ALDs?
P4	The aesthetics of the systems are a barrier; deaf young people do not want to be seen as different to their peers.
P6	For older pupils they want integrated technology and smaller transmitters so cosmetically it's more acceptable.
P8	No integrated receivers for Oticon Aids. [Audio shoe and receiver needed for Oticon's older hearing aids].
P12	Students [not] engaging with technology in secondary school.
P7	Some children don't want one.
P16	Pupil choice - older students more likely to stop using ALDs.

Responses indicated an alternative reason for rejection of ALDs is the ineffective use of the microphones by staff members. The barriers identified often go hand in hand with each other, for example lack of training/monitoring leading to ineffective use by adults which results in the deaf CYP rejecting the technology. In this study there is the impression of a knock-on effect. However, one service is attempting to address this barrier by empowering the pupils to advocate for themselves.

> *P15: "We have started to target children to help them understand their hearing loss, and what can be done to minimise the impact. With better understanding from a younger age, they may be less likely to reject technology as they get older."*

To support the continued use of ALDs P7 reported that the inclusion of the CYP as part of the decision-making process is critical for investment of use.

4.6. Summary of results

In summary, the findings for the survey conducted show that all services offer provision of ALDs to all ages. Positively there is an increase in the number of ALDs being fitted to children who are in the Early Years phase of schooling, importantly when they are at a vital stage of their language acquisition. The data shows that the interest in using the ALDs is variable with older children, the numbers of systems in use begin to reduce at KS3 and 4 and reduce further in the Post 16 age group.

Results show inconsistencies with ALD use in the home versus school for children who are of school age, but this is because of differing funding systems and financial responsibilities. Often the systems are offered for home use on a case-by-case basis but the uptake from families is variable. Schools mostly use the Phonak Roger systems, but the use of other proprietary microphones is beginning to increase. The criteria for allocation of systems showed that the majority of services employ QS1 as their eligibility for ALD provision, however this is in combination with other factors and not a sole factor.

The subject of funding is paramount to children being provided the systems for use in a timely manner. The sources of funding vary from service to service, some LA services provide funding whilst others ask schools to fund equipment. All have challenges to overcome but attempt to reduce the effect of these monetary issues on the service users. The rising cost of equipment, and onus on educational services to supply ALD equipment was another discussion point, though newer hearing devices are resembling a joint commissioning model.

LA services have a duty to monitor equipment provided and ensure that staff are trained how to use equipment effectively. However, the significant drop in use of ALDs through the secondary phase has been attributed to the ineffective use of the transmitters in schools and a lack of understanding of the needs of a deaf CYP. Pupils also play their part in the uptake of the systems; services reported that the pupils were not engaging

with technology and reported staff use as the reason. In some cases, students simply do not wish to use the systems. In other situations, they do not want to be seen as being different. There are clearly issues on both sides creating barriers to the use of ALD systems with older pupils.

5. Discussion

The survey was carried out asking questions to collect qualitative and quantitative data, exploring the provision of ALDs for school age children. Twenty-one professionals, from services providing peripatetic support to deaf children responded enabling exploration of provision and the challenges faced by services.

It is important to reiterate that, despite the title of this research project stating that it is looking at the UK provision of ALDs, the data is from a small selection of LA services in England and Wales. The 2021 CRIDE report stated there are 113 peripatetic services in England (CRIDE, 2021), due to the limited responses to this study from the other UK services, it is hard to know if the situation across the UK shares many parallels.

The findings from the results of the study will be discussed under five sections, the chapter will conclude with limitations and implications for further study.

5.1. School age provision

Research conducted by Muller (2011) and Allen et al. (2017) studied the use, the acceptability and benefits of ALDs for preschool children however the CRIDE data from 2018 still reported that 38% of services did not, at the time, make ALDs available to pre-school deaf children (CRIDE, 2018). Provision to EY deaf children present different challenges to the older age groups, hence, there needs to be careful management of the system. Any staff who use the device need information and practical guidance to understand and implement it effectively and appropriately in what can often be acoustically challenging environments (Allen et al., 2017). Since this CRIDE data collection and research mentioned, there has been a continued national drive, supported by evidence-based research, from the NDCS for pre-school families and EY settings to have access to ALDs. From the data collected in this small-scale research

project, this clearly had a positive effect, all respondents from this survey stating that EY provision is offered in their services.

5.2. Home use

It is extremely positive that all services offer provision for ALD use at home, however this good work needs to be continued by educating parents of the benefits of assistive technology. Despite the offer of technology for use in the home, not all families accept this; it could therefore be questioned if the parents are informed of the benefits of an ALD. Cole and Flexer (2010) highlight the importance for professionals to explain issues of acoustics to parents. Families need to understand the negative effects of distance and noise on language learning and auditory brain development to make an informed choice for their child.

Technology is rapidly moving forward, gone are the days of wired devices and more recently ear level receivers are being replaced by RogerDirect and Bluetooth enabled devices, ALD systems are becoming more discrete and less bulky for the deaf user and their family (Phonak, 2021; Oticon, 2021). An additional factor, which may be attributed to some proportion of increase in numbers of home, use may be responsible to Cochlear who ‘gift’ a remote microphone to the recipient of CIs at the fitting appointment; however, like with the LAs, health professionals need to educate the family about its benefits to ensure effective use of the device.

5.3. Systems in use

The Phonak Roger system is the most widely used educational ALD, but as new innovations come to market, other leading brands are offering proprietary microphones that are on a par with Phonak Roger ALDs in terms of signal quality. When comparing

the effectiveness of wireless “streaming technologies” to radio aids, Stone et al. (2022) compared what they described as streaming devices with radio aids and found that the performance of all tested microphones was broadly similar.

The key difference between the manufacturers’ proprietary microphones and the Phonak Roger System is that the latter is universal. Hearing devices using the Phonak Roger system each need to have a receiver attached or installed for the newer Marvel range. Most of the other microphones used in education can be adapted for use with the Phonak Roger systems already in use in schools. The Cochlear CI speech processors, and newer Oticon hearing aids, have their own proprietary microphones which negate the need for additional receivers.

Oticon EduMic numbers are increasing, 67% of services surveyed are now purchasing this microphone for use. It would be interesting to determine specifically how many EduMic are issued versus Phonak Roger microphones and may vary on location and dependent on which health trusts commission Oticon. One would query whether Audiologists aware of the devices available from the LA or those available to be purchased by families.

Allen et al. (2017) notes that rapid changes in technology require QToDs to constantly update their skills. Increasingly, manufacturers of implantable hearing devices are offering a proprietary microphone as part of the package. These accessories are given directly to the family often by passing the implant clinic and reports of levels of manufacturer support being low (Haylett, 2020). The survey did not draw out the number of MiniMics supplied by LA services compared to Cochlear supplied devices. Therefore, the author is unsure if the MiniMic 2+ numbers reported in this study are those provided by Cochlear directly as auditory implant recipients or LA services, or in fact a combination of the two.

5.4. Eligibility criteria

Historically the Auditory Implant Centres have asked QToDs to work on an FM Training Tool (UCLH, n.d) to train the deaf CYP to report faults in the sound quality of the CI speech processors. However, since recipients of CIs are often preverbal, this prerequisite of provision is no longer appropriate and should not prohibit the allocation of an ALD. In research undertaken by Bevington (2015), 57.4% of professionals surveyed felt that under 3s should not be fitted with an ALD until the child could report faults. She argued that if this was a concern, why is there an emphasis on early amplification? If this argument carried any weight then amplification would not be fitted until a child could provide feedback which would, no doubt, have a significant impact on the language levels of deaf children. The incidence of faults with CIs and ALDs is now far fewer, in earlier technology this would have been considered more cautiously due to the potential for interference when using FM, however recent advanced technology uses 2.4GHz to broadcast the signal and as a result, the potential for interference is no longer a viable issue, with the signal being either present or absent.

The benefits of ALDs for young children far outweigh the challenges, without an ALD the deaf CYP would be deprived of optimum access to speech and language. Cormier et al. (2012) describe of a critical window for language acquisition and that after this period, the brain is less responsive to acquiring language. Likewise, Kushalnagar et al. (2020) found a correlation between poorer child-carer communication, including exclusion from daily incidental conversation within the family, and increased incidence of multiple chronic health outcomes. Therefore, young children need access to these systems. Wolfe & Schafer (2015) suggest that there is no evidence that a correctly fitted ALD will be detrimental to the language development of a child with CIs and note that the inability to report difficulties is not a bar to receiving CIs themselves.

Parental support is stated by 66 % of participants as criteria used for a deaf CYP being eligible for an ALD. Many survey responses suggested that the ALD would only be considered for home use if the parents requested it, which naturally involves parental

support. However, if the majority of use of pupils only use their ALD in school then professionals would not deem this as a priority to the allocation of an ALD, therefore this may have had an effect on responses. Haylett (2020) stated that concerns about families' willingness to engage with another layer of technology have been cited as barriers to use of ALDs with children at home, however she found evidence that suggests careful introduction and on-going support are key to its success.

5.5. Barriers to providing ALDs

5.5.1. Funding

Funding will always be reported as a barrier and in this study there were no differences. Some services described their challenges with funding but highlighted this was not a barrier to provision, other services were resourceful with finances. When funding is based on pupil numbers this can lead to uncertainly and instability, creating complications in future budget planning. Funding mechanisms for EY and Post 16 can often be different to that of school aged children adding additional barriers to the fitting of ALDs (Bevington, 2015).

Professionals discussed the transferability of equipment between deaf pupils, this can both help and constrain budgets depending on the hearing devices worn by the deaf CYP. The provision of ALD systems has traditionally been via educational services, whereas hearing devices are provided through the National Health Service. Educational Professionals surveyed reported there should be joint commissioning, distributing the costs more fairly, however audiological services are not expected to be overly familiar with the listening conditions that the individuals are educated in and may not be able to provide the appropriate system. Likewise, if schools were in control of managing ALDs, they would not be able to liaise effectively with Audiology professionals on upgrades and the purchase of new equipment to make the system compatible; therefore, it has been the responsibility of the LA QToD service working with deaf CYP. The Phonak

Roger system makes costings very heavily biased towards Education, the proprietary microphones negate the need for the educational purchase of receivers, only the purchase of a transmitter which is less costly than most Phonak Roger microphones, however all microphones continue to send and receive signals on the 2.4GHz band. The proprietary wireless systems balance the cost more evenly between Health, suppling the hearing device and Education providing the transmitter.

With the use of proprietary microphones, there continues to be the option for education to purchase Phonak Roger receivers and a Roger transmitter depending on the ALDs already in place in the educational or home setting. The non-transferability of transmitters, when proprietary systems must be bought, is presenting a barrier to authorities predominantly where Health Care Trusts work with multiple hearing aid manufacturers or the LAs work with multiple Heath Care Trusts. This is leading to services having to choose either to risk purchasing cheaper proprietary transmitters, that could be surplus to requirements if there is an upgrade of hearing aid, or in the first instance purchase the higher costing Phonak Roger system which is future proof to a degree. Professionals have reported that Phonak Roger is a “better” system in education

> P6 “EduMic does also have limitations because Roger Touchscreen has more features.”

The Phonak Roger touchscreen is easier to connect to multiple users and has a group mic mode, this is a feature that the EduMic does not have.

5.5.2. Educational settings - Staff use

Working within different schools peripatetic QToDs, encounter many different attitudes towards the equipment used with deaf CYP. Most schools are good at supporting the deaf pupils and having a named person with responsibility for overseeing the equipment has proven valuable. The day-to-day use of ALDs in mainstream settings relies on the deaf child and mainstream staff working together, management of equipment by school

staff in primary settings is generally straightforward. There are minimal staff members who use the ALDs, initially this may be facilitated by a teaching assistant but as the child matures they can take responsibility for giving the transmitter to the teacher. In a primary setting the size of school usually allows training to be provided to all staff, despite this McCracken et al. (2012) found that children had concerns about the use and management of the ALD system. Whilst obvious challenges may arise in a busy secondary school, challenges may start much earlier, the number of adults using the ALD multiplies, and this is often when problems arise.

Research by McCracken et al. (2012) shows the ineffective use of ALDs is the primary reason for the reduction in use of systems; deaf teenagers would rather listen without an ALD than with one being used ineffectively. Furthermore, Salter et al. (2017) reported that some teachers lack the understanding of deaf CYP communication requirements. The findings from this investigation parallel with previous research where the numbers gradually reduce as age of the child increases. If transmitters are not used effectively this can result in the deaf CYP having a poor listening experience and difficulty accessing their learning. It seems there is clearly a need for more robust training, particularly, at secondary schools, capturing and training all staff who work with deaf CYP.

Provision for ALDs at Post 16 is dependent on where the young person is receiving their education. Some LAs support Post 16 students who are at a school's sixth form, but not a college and some may only support if an Education Health and Care Plan (EHCP) is in place; these differences were not investigated during this survey however could be the topic of further studies.

5.5.3. Educational settings - Pupil choice

Responses from professionals in the study suggested the deaf CYPs self-esteem was the reason assistive technology has been rejected. Warner-Czyz et al. (2015) discuss at length how self-esteem levels decrease as hearing-impaired students move through the school system and Theunissen et al. (2014) suggest that low self-esteem becomes

more apparent in school settings. Contrary to this Morris (2017) found simply being deaf does not increase the risk of having low self-esteem. Warner-Czyz et al. (2015) concluded that deaf students actually have the same self-esteem levels as their hearing peers, therefore adolescent students are more likely to want to be like their peers than risk appearing to be different (Albert, 2013 and Wolters et al., 2012).

One respondent indicated that their service is trying to empower the deaf CYP to advocate for themselves, this would work for a certain disposition of pupils but not necessarily all.

> *P15 "We have started to target children to help them understand their hearing loss, and what can be done to minimise the impact. With better understanding from a younger age, they may be less likely to reject technology as they get older."*

Modern technology is becoming increasing more aesthetically pleasing, microphones are discrete with most hearing devices having the technology internally installed negating the need for ear level receivers. Transition from primary school to secondary school also coincides with the emotional and physical changes occurring with the onset of adolescence (Davis, 2015; Brizio et al., 2015). Secondary aged students can be challenging to engage with, teenagers have busy lives, their opinions evolve and change. A student who may have had a positive deaf identity and previously keen to use ALDs may become a reluctant user of hearing devices and ALDs (Morris, 2017).

McCracken et al. (2012) carried out research investigating pupil voice, they reported that where there is good practice, the children report it provides them with a positive experience. However, many examples of poor practice were reported by the deaf children. One of the major issues was the failure of class teachers to use the mute button. This would mean that teacher discussions with other students and staff would be directly transmitted to the deaf child. This was not only irritating and embarrassing but

made it harder to concentrate. Miranda and Brazorotto (2018) also reported that teachers' knowledge about the systems poses a significant and real challenge to the continued use of ALDs. The perceived benefit (by adults) versus the actual benefit were conducted. Older pupils were able to distinguish when the ALD was truly useful and wished they were able to decide for themselves rather than be told the system should be used all of the time (McCracken et al., 2012). Teenagers highlighted the benefits of improved SNR but expressed continued frustrations of staff not managing technology effectively (Athalye et al., 2015). It is vital that the deaf CYP has autonomy if they are to sustain use of their ALD. Mulla et al. (2015) reported on Oticon's wireless streamer, which had two-way control, this enabled the CYP to have control of the listening, and overcame one of the main frustrations, resulting in immediate "buy in". The CYP was then able to focus on the benefits of the transmitter resulting in improved compliance. The study emphasises the importance of working with CYP to ensure they are getting the best of their technologies. Mobile phone Apps are beginning to give students ownership over the accessories used with their hearing devices, through the App they are able to mute and unmute the ALD by selecting alternative microphones, use of mobile phones in classes will have to be discussed with schools on an individual basis.

5.6. Limitations

This research project is a small-scale study, conducted during a global pandemic. The methods used, therefore were chosen not only for their reliability in collecting the data being sought but also for their level of achievability within the limitations of the project.

Participation in the survey was time limited, if the data collection window had been longer, more views and perspectives could have been gathered, increasing the sample size and the reliability of the results. Finally, this study has focused on the provision of ALDs across the UK, due to the data available and time limitations, a larger study could

have included wider regions and investigated further into the reduction of numbers for secondary aged children.

5.7. Implications for the future

Three additional areas were highlighted for possible future investigation:

5.7.1. ALDs in secondary schools

Further investigations are needed to enhance the listening experience of the deaf CYP in the secondary years. The training available for staff and monitoring mechanisms for effective use all need to be considered and successes shared. A priority to the use of pupil voice prior to fitting, and autonomy for when the system is used, needs to be shared with services and educational settings.

5.7.2. ALD use outside school

It is understandable why the focus has been on the EY due to the critical years for language acquisition. Good progress has been related to EY use and provision, but for older children the technology is not as important, it is more about the connectivity of devices. If families were educated on the benefits and had more understanding of the different uses of ALDs outside of school then they may have more interest in pursuing this.

5.7.3. ALDs on caseload

Exploration into the number of ALDs in use compared to the number of children on caseload, including the specific numbers across the secondary ages is required to observe if there is a trend and where there is a reduction of numbers.

6. Conclusion

The study has shown that despite positive improvements in the provision of assistive devices available for all deaf children and young people there is sporadic use of systems across the older age groups. The ineffective use of systems in secondary schools highlights the need for further staff training including teachers understanding the needs of deaf students in the classroom. It is vital that the young person is involved in all stages of the process in order for them to recognise and discuss where the ALD benefits their listening experience and that they are able to advocate for themselves.

It is essential that all teachers and staff using these systems have robust training on their effective use, which is refreshed on a regular basis. During the Covid-19 pandemic, schools were not allowing external visitors into schools and training moved from face-to-face session to remote online sessions, the effectiveness of this method of training has not been evaluated on a larger scale.

Local authorities face many differing barriers related to the funding of these systems, from the purchase of the systems, to the maintenance and a management of losses, to the monitoring of ALDs. It is pleasing to see that the number of different systems used in the classroom and in particular the manufacturer's proprietary microphones is on the increase, reducing some of the financial outlay.

Assistive technology provision and use for school age children is steadily improving, but like the provision for preschool children the drive needs to be continued with an effective training schedule and implementation of the technologies in schools. Working with the young deaf person to explain the benefits of the systems will support their 'buy-in' to using ALDs for the long term.

Responses from the survey were small and therefore cannot be taken as this is the provision UK wide, if the timescales were longer then the survey could have been distributed to a wider group of peripatetic services.

Future CRIDE surveys could ask for further information from all UK services about their provision in order to gain a more accurate representation of the true state of provision in the UK.

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Appendices

Appendix I – Ethics application

UNIVERSITY OF HERTFORDSHIRE

FORM EC1A: APPLICATION FOR ETHICS APPROVAL OF A STUDY INVOLVING HUMAN PARTICIPANTS

(Individual or Group Applications)

Please complete this form if you wish to undertake a study involving human participants.

Applicants are advised to refer to the Ethics Approval StudyNet Site and read the Guidance Notes (GN) before completing this form:
http://www.studynet2.herts.ac.uk/ptl/common/ethics.nsf/Homepage?ReadForm

Applicants are also advised to read the FAQ General Data Protection Regulation (GDPR) before completing this form.
http://www.studynet2.herts.ac.uk/ptl/common/ethics.nsf/Frequently+Asked+Questions/4AD88CD88D0F3F2D802582 9800300621

Use of this form is mandatory [see UPR RE01, 'Studies Involving Human Participants', Sections 7.1-7.3]

Approval must be sought **and granted** before any investigation involving human participants begins [UPR RE01, S

4.4 (iii)]

Note: Supervisors should submit this form on behalf of their students.

Please submit this form and any accompanying documentation to the appropriate Ethics Committee with Delegated Authority (ECDA):

Health, Science, Engineering and Technology ECDA: hsetecda@herts.ac.uk or Social Sciences, Arts and Humanities ECDA: ssahecda@herts.ac.uk

(If you require any further guidance, please contact either hsetecda@herts.ac.uk or ssahecda@herts.ac.uk)

Abbreviations: GN = Guidance Notes UPR = University Policies and Regulations

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THE STUDY

Q1 Please give the title of the proposed study

An Investigation into the Provision of Assistive Listening Devices for Deaf Children in Mainstream Schools

THE APPLICANT

Q2 Name of applicant/(principal) investigator (person undertaking this study)

Helen Cromack

Student registration number/Staff number

18006983

Email address

hc18abc@herts.ac.uk

Status:

☐Undergraduate (Foundation) ☐Undergraduate (BSc, BA)

x☐Postgraduate (taught) Postgraduate (research)

☐Staff ☐Other

If other, please provide details here:

School/Department:

School of Education

If application is from a student NOT based at University of Hertfordshire, please give the name of the partner institution: Mary Hare School, Newbury

The aim of the study is to:

Identify common barriers to the equitable provision of ALDs See what factors allow for successful provision of ALDs

Professionals working with deaf children will carry out a short online survey. Analysis of the answers may highlight areas that require further individual semi structured interviews to elicit further information for the study.

Semi structured interviews will take place with consent from participants, these will be recorded using Microsoft Teams.

Name of Programme (eg BSc (Hons) Computer Science): MSc Deaf Education Studies

Module name and module code: Research Methods and Dissertation Module - 7FHE1108

Name of Supervisor: Dr Imran Mulla Supervisor's email: i.mulla@herts.ac.uk

Name of Module Leader if applicant is undertaking a taught programme/module:

Dr Imran Mulla

Names and student/staff numbers for any additional investigators involved in this study (students should read GN Sections 1.5 and 2.2.1 concerning responsibilities of all members of the group)

-

Is this study being conducted in collaboration with another university or institution and/or does it involve working with colleagues from another institution?

☐Yes ☒No

If yes, provide details here:

DETAILS OF THE PROPOSED STUDY

Q3 Please give a short synopsis of your proposed study, stating its aims and highlighting where these aims relate to the use of human participants (See GN 2.2.3)

To seek information from Heads of Service and Teachers of the Deaf in Local Education Authorities regarding their provision of Assistive Listening Devices (ALDs) to deaf children in schools. This will be carried out using an online questionnaire and then possibly semi structured interviews.

Q4 Please give a brief explanation of the design of the study and the methods and procedures used. You should clearly state the nature of the involvement the human participants will have in your proposed study and the extent of their commitment. Ensure you provide sufficient detail for the Committee to, particularly in relation to the human participants. Refer to any Standard Operating Procedures SOPs under which you are operating here. (See GN 2.2.4).

ALDs are a significant factor in a deaf person being able to access their education, they provide optimum access to voice in noisy environments where their personal hearing devices struggle to work effectively.

Working practices of UK local authorities will be scrutinised through the use of a carefully worded online questionnaire providing participants with opportunities to answer questions on the provision of their service and collect data on the deaf children in that area, there will be the opportunity for participants to expand on their answers when they wish to add more detail. Questions have been piloted with colleagues from other local authorities and changes made to enable accessibility to all questions.

The study may show how some areas are better resourced than others, is there a reason for this? Semi structured interviews with participants using the MS Teams platform will allow development of the findings from the questionnaires to be explored in further detail through the use of open dialogue.

All information will be collated, the findings will be reported in the researchers dissertation with the hope of reporting significant findings in professional journals.

As a result, the study involves a mixed methods design including both qualitative and quantitative information. Quantitative data analysis will include analysis of descriptive statistics from the data shared by participants in order to provide a comparison between provision of services. Qualitative data analysis of responses to the open ended questionnaire will take place.

Purposeful sampling from the questionnaires to choose a sub-set for a further 6-10 semi structured interviews will lead to a thematic analysis exploring deeper into the services practices. Qualitative enquiry will be carried out to explore the responses given by participants on their LAs provision of technology.

Q5 Does the study involve the administration of substances?

☐Yes ☒No

PLEASE NOTE: If you have answered yes to this question you must ensure that the study would not be considered a clinical trial of an investigational medical product. To help you, please refer to the link below from the Medicines and Healthcare Products Regulatory Agency:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/317952/Algothrim.pdf

To help you determine whether NHS REC approval is required, you may wish to consult the Health Research Authority (HRA) decision tool: http://www.hra-decisiontools.org.uk/ethics/

If your study is considered a clinical trial and it is decided that ethical approval will be sought from the HRA, please stop completing this form and use Form EC1D, 'NHS Protocol Registration Request'; you should also seek guidance from Research Sponsorship.

I confirm that I have referred to the Medicines and Healthcare Products Regulatory Agency information and confirm that that my study is not considered a clinical trial of a medicinal product.

Please type your name here: Helen Cromack

Date: 1.7..21

Q6.1 Please give the starting date for your recruitment and data collection: 1st October 2021

Q6.2 Please give the finishing date for your data collection: 1st May 2022

(For meaning of 'starting date' and 'finishing date', see GN 2.2.6)

Q7.1 Where will the study take place?

The online questionnaire will be completed in a place chosen by the participant. Analysis of the data will take place in the researcher's home or work-base.

Any semi structured interviews on MS Teams will take place in a place chosen by the participant and the researcher will be at a work-base.

Please refer to the Guidance Notes (GN 2.2.7) which set out clearly what permissions are required;

Please tick all the statements below which apply to this study

Q7.2 Permissions

This question is about two types of permission you may need to obtain. Depending on the study you may need more than one of each of these:

i Permission to access a particular group or groups of participants to respond to your study
ii Permission to use a particular premises or location in which you wish to conduct your study

If your study involves minors/vulnerable participants, please refer to Q18 to ensure you comply with the University's requirement regarding Disclosure and Barring Service clearance.

TICK THE APPROPRIATE BOXES IN EACH COLUMN

(i) Permission to access participants		**(ii) Permission to use premises/location**	
(tick)		(tick)	

	I confirm that I have obtained permission to access my intended group of participants and that the permission is attached to this application		Permission has been obtained to carry out the study on University premises in areas outside the Schools and the agreement is attached to this application.
x	I have yet to obtain permission but I understand that this will be necessary before I commence my study. For student applicants only: I understand that the original copies of the permission letters must be verified by my supervisor before data collection commences		Permission has been obtained from an offcampus location to carry out the study on their premises and the agreement is attached to this application
	This study involves working with		I have yet to obtain permission but I understand
	minors/vulnerable participants. I/we have obtained permission from the organisation (including UH/UH Partner Institutions when appropriate) in which the study is to take place and which is responsible for the minors/vulnerable participants. The permission states the DBS requirements of the organisation for this study and confirms I/we have satisfied their DBS requirements where necessary		that this will be necessary before I commence my study. For student applicants only: I understand that the original copies of the permission must be verified by my supervisor before data collection commences
	Permission is not required for my study. **Please explain why:**		Permission is not required for my study. **Please explain why:** All remote surveys via online platforms therefore no physical location is required.

HARMS, HAZARDS AND RISKS

Q8.1 It might be appropriate to conduct a risk assessment (in respect of the hazards/risks affecting both the participants and/or investigators). **Please use form EC5, Harms, Hazards and Risks, if the answer to any of the questions below is 'yes'.**

If you are required to complete and submit a School-specific risk assessment (in accordance with the requirements of the originating School) it is acceptable to make a cross-reference from this document to Form EC5 in order not to have to repeat the information twice.

Will this study involve any of the following?

Invasive Procedures/administration of any substance/s? ☐YES ☒NO

IF 'YES' TO THE ABOVE PLEASE COMPLETE EC1 APPENDIX 1 AS WELL AND INCLUDE IT WITH YOUR APPLICATION

Are there potential hazards to participant/investigator(s) ☐YES ☐NO from the proposed study? (Physical/Emotional or other non- physical harm)

Will or could aftercare and/or support be needed by participants? ☐YES ☐NO

Q8.2 Is the study being conducted off-campus (i.e. not at UH/UH Partner?) ☒YES ☐NO

It might be appropriate to conduct a risk assessment of the proposed location for your study (in respect of the hazards/risks affecting both the participants and/or investigators) (this might be relevant for on-campus locations as well). Please use Form EC5 and, if required, a School-specific risk assessment (See GN 2.2.8 of the Guidance Notes).

If you do not consider it necessary to submit a risk assessment, please give your reasons:

The participants will be filling in a questionnaire during their own time in a location that suits. Semi structured interviews will take place at a mutually convenient time remotely. Participants will be covered by their own risk assessments.

ABOUT YOUR PARTICIPANTS

Q9 Please give a brief description of the kind of people you hope/intend to have as participants, for instance, a sample of the general population, University students, people affected by a particular medical condition, children within a given age group, employees of a particular firm, people who support a particular political party, and state whether there are any upper or lower age restrictions.

Educational Audiologists or the Teacher/Person in charge of a peripatetic service provision for deaf children. In particular a person who may be responsible or knowledgeable about the procedures for the allocation of ALDs within that Local Authority. There are no age limits.

Q10 Please state here the maximum number of participants you hope will participate in your study. Please indicate the maximum numbers of participants for ***each*** method of data collection.

15-30 questionnaire participants, 6-10 interviewees

Q11 By completing this form, you are indicating that you are reasonably sure that you will be successful in obtaining the number of participants which you hope/intend to recruit. Please outline here your recruitment (sampling) method and how you will advertise your study. (See GN 2.2.9).

Through Educational Audiologist professional contacts and the British Association of Educational Audiologist (BAEA) forum in addition through the British Association of Teachers of the Deaf (BATOD) forum, Heads of Service (HOS) groups and professional contacts.

CONFIDENTIALITY AND CONSENT

(For guidance on issues relating to consent, see GN 2.2.10, GN 3.1 and UPR RE01, SS 2.3 and 2.4 and the Ethics Approval StudyNet Site FAQs)

Q12 How will you obtain consent from the participants? Please explain the consent process for each method of data collection identified in Q4

☒ Express/explicit consent using an EC3 Consent Form and an EC6 Participant Information Sheet (or equivalent documentation)

☒ Implied consent (participant information will be provided, for example, at the start of the questionnaire/survey etc)

☐ Consent by proxy (for example, given by parent/guardian)

Use this space to describe how consent is to be obtained and recorded for each method of data collection. The information you give must be sufficient to enable the Committee to understand exactly what it is that prospective participants are being asked to agree to.

Questionnaire will use implied consent – consent will be included at the beginning of the questionnaire, the. EC6 participant sheet will be attached to the email..

Semi structured interviews – Explicit consent required, the volunteer participant will be contacted and sent EC3 and EC6 documents.

If you do not intend to obtain consent from participants please explain why it is considered

unnecessary or impossible or otherwise inappropriate to seek consent.

Q13 If the participant is a minor (under 18 years of age) or is unable for any reason to give full consent on their own, state here whose consent will be obtained and how? (See especially GN 3.6 and 3.7)

N/A

Q14.1 Will anyone other than yourself and the participants be present with you when conducting this study? (See GN 2.2.10)

☐YES ☒NO

If YES, please state the relationship between anyone else who is present other than the applicant and/or participants (eg health professional, parent/guardian of the participant).

Q14.2 Will the proposed study be conducted in private?

☒YES ☐NO

If 'No', what steps will be taken to ensure confidentiality of the participants' information. (See GN 2.2.10):

N/A

Q15.1 Are personal data of any sort (such as name, age, gender, occupation, contact details or images) to be obtained from or in respect of any participant? (See GN 2.2.11) (You will be required to adhere to the arrangements declared in this application concerning confidentiality of data and its storage. The Participant Information Sheet (Form EC6 or equivalent) must explain the arrangements clearly.)

☐YES ☒NO

If YES, give details of personal data to be gathered and indicate how it will be stored.

Participants are asked in the questionnaire to give their name and contact details only if they wish to participate in the further interview stage of the research.

Participants are asked their job role and which local authority they are employed by to aid comparisons. This information will be anonymised in any research findings.

All information will be stored on my laptop which is password encrypted and stored securely at all times. No hard copy data will be kept.

The questionnaire will be electronically stored using the UH approved JISC online surveys.

PLEASE NOTE: If you are processing personal information you MUST consider whether you need to complete a Data Protection Impact Assessment (DPIA). Please read the DPIA guidance available from the FAQ section of the UH Ethics Approval StudyNet site:

http://www.studynet2.herts.ac.uk/ptl/common/ethics.nsf/Frequently+Asked+Questions/935D97CDBC546E69802583A9005213A6

If you need to complete one, please find the DPIA template in the University's website at the following link:

https://www.herts.ac.uk/__data/assets/pdf_file/0006/233619/IM08-apxI-Template-Data-ProtectionImpact-Assessment.pdf

The DPIA must be completed in consultation with the University's Data Protection Officer and submitted with your application for ethics approval.

Will you be making recordings?

☒YES ☐NO

If YES, give details of the types of recordings to be made and describe how and where they will be securely stored.

If Semi structured interviews are carried out, then a voice/video recording will be made.

These will be downloaded from MS Teams as soon as they are completed and will be stored on a lockable and password protected laptop which is stored and secured in accordance with HCC work policies. Once downloaded they will be deleted from MS Teams. The link to the MS Teams recording is available for 21 days only. All data and recordings will be deleted in accordance with the Data Protection policies of Hertfordshire County Council and the University of Hertfordshire.

Q15.2 If you have made a YES response to any part of Q15.1, please state what steps will be taken to prevent or regulate access to personal data and/or recordings beyond the immediate investigative team, as indicated in the Participant Information Sheet.

Participants will be informed that their data will be anonymised prior to storage and that all information/ A-V recording will be stored on student's UH One Drive. All data and recordings will be deleted in accordance with the Data Protection policies of Hertfordshire County Council and the University of Hertfordshire.

Indicate what assurances will be given to participants about the security of, and access to, personal data and/or recordings, as indicated in the Participant Information Sheet.

The data collected will be stored electronically, in a password-protected environment, for the duration of the study and will then be deleted in accordance with the Data Protection policies of Hertfordshire County Council and the University of Hertfordshire. The data will be anonymised prior to storage.

State as far as you are able to do so how long personal data and/or recordings collected/made during the study will be retained and what arrangements have been made for its/their secure storage and destruction, as indicated in the Participant Information Sheet.

The data collected will be stored electronically, in a password-protected environment, for the duration of the study and then will be deleted in accordance with the Data Protection policies of Hertfordshire County Council and the University of Hertfordshire.

Q15.3 Will data be anonymised prior to storage?

☒YES ☐NO

Q16 Is it intended (or possible) that data might be used beyond the present study? (See GN 2.2.10)

☐YES ☒NO

If YES, please indicate the kind of further use that is intended (or which may be possible).

If NO, will the data be kept for a set period and then destroyed under secure conditions?

☒YES ☐NO

If NO, please explain why not:

Q17 Consent Forms: what arrangements have been made for the storage of Consent Forms and for how long?

Consent forms will all be electronically stored on the researcher's UH One Drive

Q18 If the activity/activities involve work with children and/or vulnerable adults satisfactory Disclosure and Barring Service (DBS) clearance may be required by investigators. You are required to check with the organisation (including UH/UH Partners where appropriate) responsible for the minors/vulnerable participants whether or not they require DBS clearance.

Any permission from the organisation confirming their approval for you to undertake the activities with the children/vulnerable group for which they are responsible should make specific reference to any DBS requirements they impose and their permission letter/email must be included with your application.

More information is available via the DBS website - https://www.gov.uk/government/organisations/disclosure-and-barring-service

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REWARDS

Q19.1 Are you receiving any financial or other reward connected with this study? (See GN 2.2.14 and UPR RE01, S 2.3)

☐YES ☒NO

If YES, give details here:

Click here to enter text.

Q19.2 Are participants going to receive any financial or other reward connected with the study? (Please note that the University does not allow participants to be given a financial inducement.) (See UPR RE01,

S 2.3)

☐YES ☒NO

If YES, provide details here:

Click here to enter text.

Q19.3 Will anybody else (including any other members of the investigative team) receive any financial or other reward connected with this study?

☐YES ☒NO

If YES, provide details here:

Click here to enter text.

OTHER RELEVANT MATTERS

Q20 Enter here anything else you want to say in support of your application, or which you believe may assist the Committee in reaching its decision.

Click here to enter text.

DOCUMENTS TO BE ATTACHED

Please indicate below which documents are attached to this application:

☐ Permission to access groups of participants

☐ Permission to use University premises beyond areas of School

☐ Permission from off-campus location(s) to be used to conduct this study ☐ Form EC5 (Harms, Hazards and Risks: assessment and mitigation) x☐ Consent Form (See Form EC3/EC4) x☐ Form EC6 (Participant Info Sheet) ☐ Data Protection Impact Assessment (DPIA)

x☐ A copy of the proposed questionnaire and/or interview schedule (if appropriate for this study). For unstructured methods, please provide details of the subject areas that will be covered and any boundaries that have been agreed with your Supervisor

☐ Any other relevant documents, such as a debrief, meeting report. Please provide details here:

Click here to enter text.

DECLARATIONS

1 DECLARATION BY APPLICANT

1.1 I undertake, to the best of my ability, to abide by UPR RE01, 'Studies Involving the Use of Human Participants', in carrying out the study.

1.2 I undertake to explain the nature of the study and all possible risks to potential participants,

1.3 Data relating to participants will be handled with great care. No data relating to named or identifiable participants will be passed on to others without the written consent of the participants concerned, unless they have already consented to such sharing of data when they agreed to take

Page

part in the study.

1.4 All participants will be informed **(a)** that they are not obliged to take part in the study, and **(b)** that they may withdraw at any time without disadvantage or having to give a reason.

(**NOTE**: Where the participant is a minor or is otherwise unable, for any reason, to give full consent on their own, references here to participants being given an explanation or information, or being asked to give their consent, are to be understood as referring to the person giving consent on their behalf. (See Q 12; also GN Pt. 3, and especially 3.6 & 3.7))

Enter your name here: Helen Cromack Date 23/09/2021

2 GROUP APPLICATION

(If you are making this application on behalf of a group of students/staff, please complete this section as well)

I confirm that I have agreement of the other members of the group to sign this declaration on their behalf

Enter your name here: Click here to enter text. Date Click here to enter a date.

DECLARATION BY SUPERVISOR (see GN 2.1.6)

I confirm that the proposed study has been appropriately vetted within the School in respect of its

aims and methods; that I have discussed this application for Ethics Committee approval with the applicant and approve its submission; that I accept responsibility for guiding the applicant so as to ensure compliance with the terms of the protocol and with any applicable ethical code(s); and that if there are conditions of the approval, they have been met.

Enter your name here: Imran Mulla Date 29/09/2021

Appendix II – Ethics approval

University of Hertfordshire UH

SOCIAL SCIENCES, ARTS AND HUMANITIES ECDA

ETHICS APPROVAL NOTIFICATION

TO **Helen Cromack**

CC **Dr Imran Mulla**

FROM **Dr Ian Willcock, Social Sciences, Arts and Humanities ECDA Chairman**

DATE **11/10/2021**

Protocol number: cEDU/PGT/UH/05268

Title of study: An Investigation into the Provision of Assistive Listening Devices for Deaf Children in Mainstream Schools

Your application for ethics approval has been accepted and approved with the following conditions by the ECDA for your School and includes work undertaken for this study by the named additional workers below:

no additional workers named

Conditions of approval specific to your study:

Ethics approval has been granted subject to the supervisor checking the following points before the study starts:

Implicit consent is no longer considered best practice and the survey needs to include a button or tickbox to record explicit consent to participate (the template below can be edited and used instead of the EC6 for the survey) – I think this is already being done, but there may be some minor revisions to the wording of the survey information section needed.

All data (once downloaded from the online surveys system), consent forms and recordings must only be stored on the student's UH-supplied One Drive system (i.e.there must be no use of a personal laptop for storage).

General conditions of approval:

Ethics approval has been granted subject to the standard conditions below:

Permissions: Any necessary permissions for the use of premises/location and accessing

participants for your study must be obtained in writing prior to any data collection commencing. Failure to obtain adequate permissions may be considered a breach of this protocol.

External communications: Ensure you quote the UH protocol number and the name of the approving Committee on all paperwork, including recruitment advertisements/online requests, for this study.

Invasive procedures: If your research involves invasive procedures you are required to complete and submit an EC7 Protocol Monitoring Form, and copies of your completed consent paperwork to this ECDA once your study is complete.

Submission: Students must include this Approval Notification with their submission.

Validity:

This approval is valid:

From: 11/10/2021

To: 01/05/2022

Please note:

Failure to comply with the conditions of approval will be considered a breach of protocol and may result in disciplinary action which could include academic penalties. Additional documentation requested as a condition of this approval protocol may be submitted via your supervisor to the Ethics Clerks as it becomes available. All documentation relating to this study, including the information/documents noted in the conditions above, must be available for your supervisor at the time of submitting your work so that they are able to confirm that you have complied with this protocol.

Should you amend any aspect of your research or wish to apply for an extension to your study you will need your supervisor's approval (if you are a student) and must complete and submit form EC2.

Approval applies specifically to the research study/methodology and timings as detailed in your Form EC1A. In cases where the amendments to the original study are deemed to be substantial, a new Form EC1A may need to be completed prior to the study being undertaken.

Failure to report adverse circumstance/s may be considered misconduct.

Should adverse circumstances arise during this study such as physical reaction/harm, mental/emotional harm, intrusion of privacy or breach of confidentiality this must be reported to the approving Committee immediately.

Template Text for Online Survey use.

Version 1.1

This text should be edited and placed at the top of the online survey.

There should then be a checkbox or button through which the subject can confirm their explicit consent to participate.

All text in red must be edited by the applicant.

You are being invited to complete an online survey as part of a final year/ Master's course being undertaken by student name, a name of course student at Name of School, University of Hertfordshire, UK.

Please read the following information carefully before deciding whether to take part.

Please ask if there is anything that is not clear or if you would like more information.

You are eligible to take part in this study if you are 18 or over (State any other inclusion criteria).

The Study

The purpose of the study is to (provide participants with a statement of the purpose and objectives of the research, using easily understood language)

What does taking part involve?

If you agree to take part in this study, you will be asked to complete an online survey/questionnaire. This survey/questionnaire will ask about (insert topic of questions, especially if sensitive issues will be asked about) and it will take you approximately [XX] minutes to complete.

Do I have to take part?

No. It is up to you to decide whether or not to take part. You are free to withdraw from the study at any time and without giving a reason. If you choose not to take part, you do not need to do anything further.

Are there any benefits or risks for me if I take part?

You may not directly benefit from this research; however, we hope that your participation in the study may (describe any other possible benefits).

There are no expected risks for participants. (Adapt this statement according to the content of the questionnaire). Any data that you provide will be treated as confidential and the questionnaire is anonymous.

All data from the study will be stored securely on my university One Drive cloud storage system which only I have access to and will be deleted (say when data will be deleted).

What will happen to the findings of this study?

The findings will be used to (produce data to answer my research questions – or describe other data use).

Has this study received ethical approval?

This study has been approved by the University of Hertfordshire Social Sciences, Arts and Humanities, Ethics Committee with Delegated Authority (SSAH ECDA). The

Ethics Protocol number for this study is XXXX

If you would like to receive more information and for any other queries about this project you can contact me by email (student's email address) or my Supervisor, Supervisor's name (Supervisor's email)

Although we hope it is not the case, if you have any complaints or concerns about any aspect of the way you have been approached or treated during the course of this study, please write to the University's Secretary and Registrar at the following address:

Secretary and Registrar

University of Hertfordshire

College Lane

Hatfield

Herts

AL10 9AB

United Kingdom

If you do not wish to participate in this survey, just close your browser. (ensure the respondent cannot proceed to the survey)

If you are interested in taking part, please read the statements below and then click

'yes' to record your consent to participate.

I confirm that I have read the study information. I have had the opportunity to consider the information and ask questions. Any questions have been answered satisfactorily

I understand that my participation is voluntary, and I am free to withdraw from the study at any time without giving a reason

I am 18 or over

YES button

If Yes is clicked, then the participant should automatically go through to the body of the survey.

Appendix III - Survey

MSc Investigation into ALD Provision

Participants Information

Please only complete if you work in a service that provides peripatetic support to deaf children.

An investigation into the provision of Assistive Listening Devices (ALDs) to deaf children in mainstream schools.

UH Protocol number cEDU/PGT/UH/05268

You are being invited to complete an online survey as part of a Master's Degree being undertaken by Helen Cromack, MSc Deaf Education Studies (Educational Audiology) at the University of Hertfordshire (Mary Hare), UK.
Please read the following information carefully before deciding whether to take part. Please ask if there is anything that is not clear or if you would like more information.

You are eligible to take part in this study if you are 18 or over and work for a service providing peripatetic support.

The Study
The purpose of the study is to gain a better understanding of the national provision of ALDs to deaf children.
What does taking part involve?
If you agree to take part in this study, you will be asked to complete an online survey/questionnaire. This survey/questionnaire will ask about your service's provision for deaf children and it will take you approximately 10-15 minutes to complete.
Do I have to take part?
No. It is up to you to decide whether or not to take part. You are free to withdraw from the study at any time and without giving a reason. If you choose not to take part, please select 'no' on the next page.
Are there any benefits or risks for me if I take part?
You may not directly benefit from this research; however, we hope that your participation in the study may highlight the barriers faced by services to provide ALDs and the study will discuss whether there is parity in the national provision for deaf children.

1 / 11

There are no expected risks for participants. Any data that you provide will be treated as confidential and the questionnaire is anonymous.
All data from the study will be stored securely on my university One Drive cloud storage system which only I have access to and will be deleted once the course has been completed.

What will happen to the findings of this study?

The findings will be used to produce data to answer my research questions.

Has this study received ethical approval?

This study has been approved by the University of Hertfordshire Social Sciences, Arts and Humanities, Ethics Committee with Delegated Authority (SSAH ECDA). The Ethics Protocol number for this study is cEDU/PGT/UH/05268
If you would like to receive more information and for any other queries about this project you can contact me by email (hc18abc@herts.ac.uk) or my Supervisor, Dr I. Mulla (i.mulla@herts.ac.uk).
Although we hope it is not the case, if you have any complaints or concerns about any aspect of the way you have been approached or treated during the course of this study, please write to the University's Secretary and Registrar at the following address:
Secretary and Registrar
University of Hertfordshire
College Lane
Hatfield
Herts
AL10 9AB

You may be invited to a follow up discussion on MS Teams, if you would like to please fill in your details in Question 16.

Thank you very much for reading this information and giving consideration to taking part in this study.

Consent

1. I have read the participants information on the previous page and agree to the terms and conditions

- Yes
- No

Questionnaire

2. What is your job title? * *Required*

- ○ Teacher of the Deaf
- ○ Educational Audiologist
- ○ Head of Service
- ○ Other

2.a. If you selected Other, please specify:

3. Which Local Authority do you work for?

4. What degrees of deafness do you provide ALDs for? Please select all that apply.

- ☐ Unilateral
- ☐ Mild
- ☐ Moderate
- ☐ Severe
- ☐ Profound

5. How many deaf children does your service support?

6. How many full time equivalent Teachers of the Deaf does your service employ?

7. Do you issue ALDs to children in these age ranges and if so how many children in these age bands use an ALD?

	Do you issue ALDs to this age group? Yes/ No	How many deaf children in your service use an ALD in this age group?
EYFS		
KS 1		
KS 2		
KS 3 + 4		
Post 16		

8. Does your service allow for the ALD system to be used at home?

- Yes
- No

8.a. If you selected "yes", please specify:

9. Which systems do your service use? Please indicate all that apply.

- [ ] Roger (Inspiro, Touchscreen, Pen, Select and On)
- [ ] Cochlear Minimic (including 2+)
- [ ] Oticon EduMic
- [ ] Other

9.a. If you selected Other, please specify:

10. Does you service have a written ALD policy?

- ( ) Yes
- ( ) No

Sharing of ALD Policy

Would you be kind enough to share your service's policy with me?

Identifiable information will be removed and be anonymised. I would be very grateful if you could email your policy to me at:

hc18abc@herts.ac.uk

11. Does your service offer additional insurance for the ALD systems in use?

- ○ Yes
- ○ No

12. What criteria does your service use for allocation of systems ? Please indicate all that apply.

- ☐ Speech discrimination assessments
- ☐ Age of child
- ☐ Parental support
- ☐ Good use of hearing devices
- ☐ Liaisons with other professionals
- ☐ Every child is considered a candidate (Quality Standard 1)
- ☐ Other

12.a. If you selected Other, please specify:

13. Does your service have an Audiology budget that ALDs are purchased from?

- ○ Yes
- ○ No
- ○ Other

13.a. If you selected Other, please specify:

14. Is this funding based on pupil numbers or an annually set budget?

- Based on pupil numbers
- A set budget
- Other

14.a. If you selected Other, please specify:

15. Has the new legislation for tamperproofing devices holding button batteries impacted on your service's provision of ALDs?

- Yes
- No

16. In your opinion, what is the main barrier in preventing more deaf pupils using ALDs?

17. If you would be happy to take part in a further MS Teams interview (should it be necessary) please leave your name and contact details below.

Thank you for your time in completing this questionnaire.