

Assistive Technology for Hearing Impaired Population: Investigating the Knowledge of Special Educators

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Abstract

The present study investigates the knowledge on Assistive Listening Device among Special Education teachers, who work specially with hearing impaired population. A total of 35 special educators participated. A questionnaire was developed and distributed. Findings indicated that special educators have a working knowledge of assistive listening devices. No discernible difference was seen when comparing the findings between the year of work exposure and the knowledge on Assistive listening device. The study concludes that special education teachers who work with hearing impaired groups are knowledgeable about assistive listening devices, but they are less accurate in domains and tactile aids.

Introduction

The term "hard of hearing" describes hearing loss that can be mild to severe. They can communicate through verbally and can benefit from cochlear implants, hearing aids, and other assistive technology. Experiencing profound hearing loss, often use sign language for communication. More than 5% of people worldwide require rehabilitation for their "disabling" hearing loss (432 million adults and 34 million children). Over 700 million people, or one in ten people, are predicted to have a hearing loss that is incapacitating by the year 2050.

Assistive device or assistive technology helps a person with hearing loss, voice, speech, or language disorder to communicate. With this technology, a person who has trouble in communicating can hear and understand conversations better or communicate their ideas more easily. The advancement of these technologies makes more accessible, allowing people to communicate more meaningfully and participate more fully in communication on their daily lives.

Assistive Listening Devices are various types of amplification devices designed to improve communication for people who are deaf or hard of hearing and to ensure optimal communication when individual hearing instruments are insufficient. In comparison to analogue ALD systems, digital wireless technology for hearing instruments promotes new ALDs and improvements to existing devices.

Basically, ALDs separate the sounds, particularly speech, that a person wants to hear from background noise and improves the 'speech to noise ratio (SNR)' rather than the 'signal to noise ratio'. So, the primary purpose of ALDs is to accomplish better SNR in a variety of situations for people with hard of hearing. ALDs improve speech to noise ratio by reducing the triangle of problems like noise, distance, and reverberation. ALD's will minimize the background noise and the negative influences due to distance from sound source to the person with hard of hearing.

ALDs for large settings include classrooms, theaters, various communication halls, religious sites, and airports. Some ALDs are also designed for compact setups. Frequency-modulated (FM), infrared, and hearing loop systems are examples of ALD systems covering large areas. Other types are designed for individual use or personal interaction in smaller areas. One can use these ALDs with or without cochlear implants or hearing aids.

The atmosphere for communication access and the hearing loss determine which ALD can be used. Audio induction loops, FM systems, infrared systems, personal amplified systems, and Bluetooth systems are the five main categories of assistive listening equipment.

To educate children with exceptional needs, special educators receive specialised training. Communication between special educators and children who have hearing impairments is crucial for their educational and daily progress. Therefore, special educators who work with hearing-impaired individuals should be well-versed in the tools and technologies that help them get beyond obstacles to greater communication. This study examines the level of familiarity with assistive listening devices among special educators who now only work with the deaf population.

Review of Literature

Sulaimani & Bagadood (2022) examined the Special Education Teachers 'Perceptions of Assistive Technology (AT) for students with Intellectual Disability (ID) in Saudi Arabia. The findings reveal that the teachers interviewed incorporate AT into the academic setting, and agree that such technology can foster student learning, assignment completion, and engagement.

Alharbi (2018) investigated the knowledge and use of assistive technology by elementary special education teachers in inclusive classrooms in Saudi Arabia. Results indicate that there needs to be increase knowledge and use of assistive technology for elementary special education teachers in order to help students with disabilities accessing to learning materials and general education curriculums in inclusive setting.

Hartley, Rochtchina, Newall, Golding & Mitchell (2010) determined the prevalence, usage, and factors associated with the use of hearing aids and ALDs in an older representative Australian population. Results indicated hearing aid ownership and ALD usage remains low in

the older population. Given the significant proportion of older people who self-report and have a measured hearing loss, it is possible that more could be helped through the increased use of hearing aid and/or ALD technology. Greater efforts are needed to promote the benefits of these technologies and to support their use among older people with hearing loss.

Sydeski (2013) investigated high school special education teachers' knowledge of assistive technology (AT) for students with reading difficulties in Southwestern Pennsylvania. Results of the study suggest that professional development is needed for advancing teacher knowledge of AT and assisting students with reading difficulties to meet the requirements of federal and state laws.

Alanazi (2019) explored teachers' attitudes toward using assistive technology (AT) for students with autism spectrum disorder (ASD) in classrooms. Results indicated that trained teachers report a greater use of AT in classrooms for students with ASD. Compared to pre-school teachers, middle school teachers report a greater use of AT. Teachers who have more years of teaching experience also report a greater use of AT in classrooms for students with ASD.

Flanagan, Bouck & Richardson (2013) examined middle school special education teachers' perceptions of assistive technology during literacy instruction with students with high incidence disabilities. Results suggested teachers perceived assistive technology to be an effective tool for literacy but use it minimally. When assistive technology was used, teachers indicated it was an effective literacy support. Teachers also reported barriers to using assistive technology in literacy including cost, usability, and lack of training/experience. However, factors such as previous successful experiences with assistive technology and assistive technology supporting students' learning encouraged assistive technology use. The consistency of teachers' reports of needing more experience and knowledge in assistive technology to fully use it suggests implications for preservice preparation such as providing additional experiences and information on assistive technology.

Zanin & Rance (2016) assessed the benefit of assistive listening devices (ALDs) for students with hearing impairment in mainstream schools. Results show that performance in each ALD configuration was higher than for HAs/CIs alone ($p < 0.001$) and it shows that significant improvement in listening/communication when using the remote microphone in conjunction with HAs/CIs ($p < 0.05$). There was no difference between the sound field system and the baseline measurement ($p > 0.05$).

Hornickel, Zecker, Bradlow & Kraus (2012) Assistive listening devices drive neuroplasticity in children with dyslexia and the result shows that Assistive listening devices can improve the neural representation of speech and impact reading-related skills by enhancing acoustic clarity and attention, reducing variability in auditory processing.

Methodology

Aim

The present study aims to examine the knowledge on Assistive Listening Devices among the trained special educators who work with the hearing-impaired sectors.

Objectives

- To examine the knowledge of ALD among special educators.
- To compare the year of experience with the knowledge on ALD

The present study was done in **two phases**.

Phase – 1: Preparation of Questionnaire

A questionnaire with two sections of total 20 questions was developed. The validation process on questionnaire was completed by 3 speech and language professionals and to 3 Special educators who are currently in practice.

On top of questionnaire general information on their demographics, year of experience were mentioned. On 20 questions, first 10 questions in Section- A is multiple choice pattern where 4 choices were given, one among the choice will be the answer for target question. Other 10 questions on Section – B is Yes/No pattern. All 20 questions focus the knowledge on technical part of ALD, Its types and its uses mainly with the hearing- impaired population.

Phase- 2: Participants with Inclusive and Exclusive Criteria

35 participants in both female and male with the experience of 2- 29 years were participated in this study. All the participants were certified special educators, and some are specially educated to deal with hearing impaired population. All participants were currently working under hearing impaired sectors in special schools at Chennai. The study excluded retired special educators who are not currently working, untrained or uncertified special educators, and special educators who work in the fields of other disabilities.

Significance of the Study

Special educators who work with hearing impaired children are in a need to be aware of their barriers and to be knowledgeable on the technologies which will help them to overcome the difficulties. So, this study highlights the knowledge on ALD's among special educators who specially work with Hearing Impaired population and be a base for future development to educate the knowledge on ALD's

Procedure

The printed questionnaire was distributed to target participants and explained the need of study to overcome the error and to get an appropriate response for the questions assessed.

Statistical Analysis

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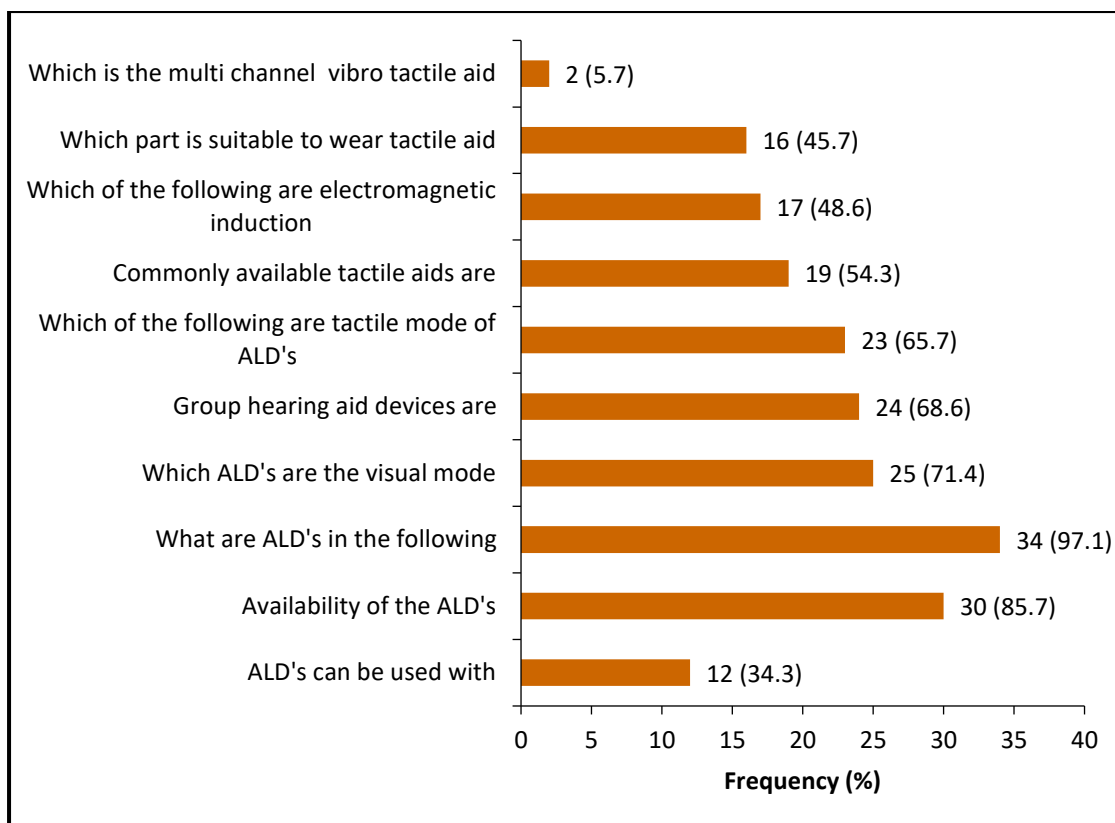
The collected data were summarized by using the Descriptive Statistics: frequency and percentage. To find the association between knowledge and years of experience, the Fisher's exact or Chi square test was used. The p value < 0.05 was considered as significant. Data were analyzed by using the SPSS software (SPSS Inc.; Chicago, IL) version 26.0.

Results and Discussion

Table 1: Frequency and Percentage for Multiple choice questions.

(n= 35)	Correct Response		Incorrect Response	
	Frequency	%	Frequency	%
ALD's can be used with	12	34.3	23	65.7
Availability of the ALD's	30	85.7	5	14.3
What are ALD's in the following	34	97.1	1	2.9
Which ALD's are the visual mode	25	71.4	10	28.6
Group hearing aid devices are	24	68.6	11	31.4
Which of the following are tactile mode of ALD's	23	65.7	12	34.3
Commonly available tactile aids are	19	54.3	16	45.7
Which of the following are electromagnetic induction	17	48.6	18	51.4
Which part is suitable to wear tactile aid	16	45.7	19	54.3
Which is the multi-channel vibro tactile aid	2	5.7	33	94.3

Figure: 1 Knowledge for Multiple choice question



Knowledge on Multiple Choice Question

On the following multiple choices,

65.7 % participants unsure of who will utilize ALD.

85.7% of participants were accurate about the availability of the ALD.

97.1% were aware on types of ALD's.

71.4% were accurate which of the following will come under visual mode.

68.6% of participants were accurate about which all will come under group hearing aid devices.

65.7% of participants were aware of which is tactile mode of ALD on the following choices.

54.3% of participants were aware of commonly available tactile aids.

51.4% were accurate about electromagnetic induction.

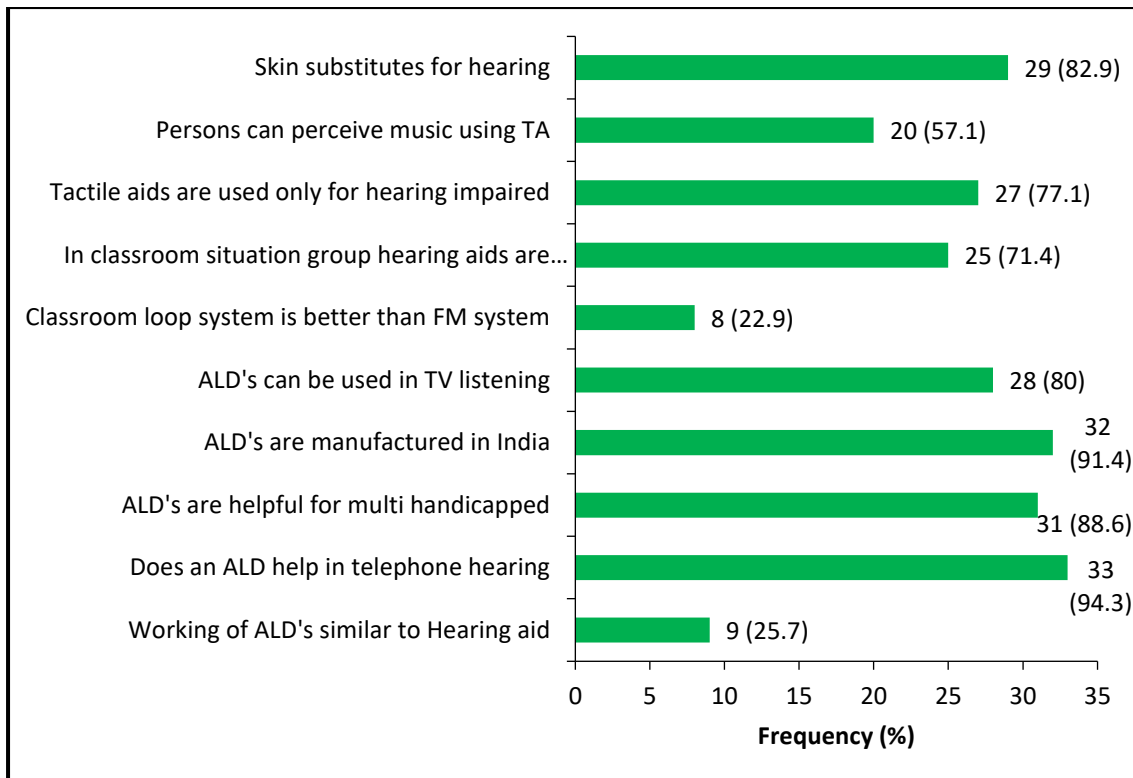
54.3% lacked knowledge about the appropriate skin area for wearing tactile aids.

94.4 % were not aware of multichannel vibro tactile aid.

Table 2: Frequency and Percentage for Yes / No questions.

(n=35)	Yes		No	
	Frequency	%	Frequency	%
Working of ALD's similar to Hearing aid	9	25.7	26	74.3
Does an ALD help in telephone hearing	33	94.3	2	5.7
ALD's are helpful for multi handicapped	31	88.6	4	11.4
ALD's are manufactured in India	32	91.4	3	8.6
ALD's can be used in TV listening	28	80	7	20
Classroom loop system is better than FM system	8	22.9	27	77.1
In classroom situation group hearing aids are better than body level hearing aid	25	71.4	10	28.6
Tactile aids are used only for hearing impaired	27	77.1	8	22.9
Persons can perceive music using TA	20	57.1	15	42.9
Skin substitutes for hearing	29	82.9	6	17.1

Figure: 2 Knowledge for Yes/ no questions



Knowledge on Yes/No Questions

74.3% of participants were not aware that ALD works different when compared to hearing aid.

94.3% were accurate that ALD helps in telephone hearing.

88.6% were aware that multiple handicapped can use ALD's.

91.4% were sure that ALD's are manufactured in India.

80% were accurate that ALD's can be used for listening television.

77.1% were confused which system is better either classroom system or FM system.

71.4% were aware that group hearing aids are better in class room setup when compared to body level hearing aids.

77.1% were not aware of which population can use tactile aids of ALD's.

57.1% were aware that music can be perceived using tactile aids.

82.9% were sure that skin substitutes for hearing.

Table 3: Correlation between year of experience and knowledge on ALD for Multiple choice questions.

(n=35)		Experience				Fisher's exact / Chi square test#	p value
		< 10		≥ 10			
		n	%	n	%		
ALD's can be used with	Yes	5	38.5	7	31.8	0.263	0.726
	No	8	61.5	15	68.2		
Availability of the ALD's	Yes	9	69.2	21	95.5	0.049	0.052
	No	4	30.8	1	4.5		
What are ALD's in the following	Yes	13	100.0	21	95.5	0.629	1.000
	No	0	0.0	1	4.5		
Which ALD's are the visual mode	Yes	11	84.6	14	63.6	0.136	0.259
	No	2	15.4	8	36.4		
Group hearing aid devices are	Yes	8	61.5	16	72.7	0.230	0.708
	No	5	38.5	6	27.3		
Which of the following are tactile mode of ALD's	Yes	8	61.5	15	68.2	0.263	0.726
	No	5	38.5	7	31.8		
Commonly available tactile aids are	Yes	6	46.2	13	59.1	0.551#	0.458
	No	7	53.8	9	40.9		
Which of the following are electromagnetic induction	Yes	6	46.2	11	50.0	0.048#	0.826
	No	7	53.8	11	50.0		
Which part is suitable to wear tactile aid	Yes	5	38.5	11	50.0	0.438#	0.508
	No	8	61.5	11	50.0		
Which is the multi-channel vibro tactile aid	Yes	0	0.0	2	9.1	0.388	0.519
	No	13	100.0	20	90.9		

Figure: 3 Knowledge (Multiple choice) according to years of experience

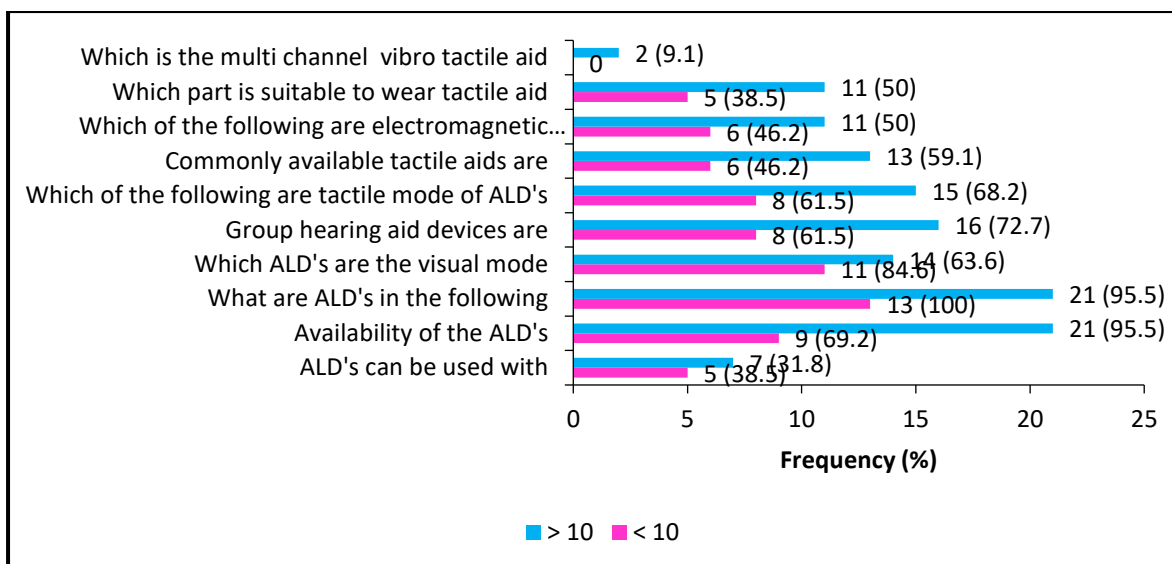
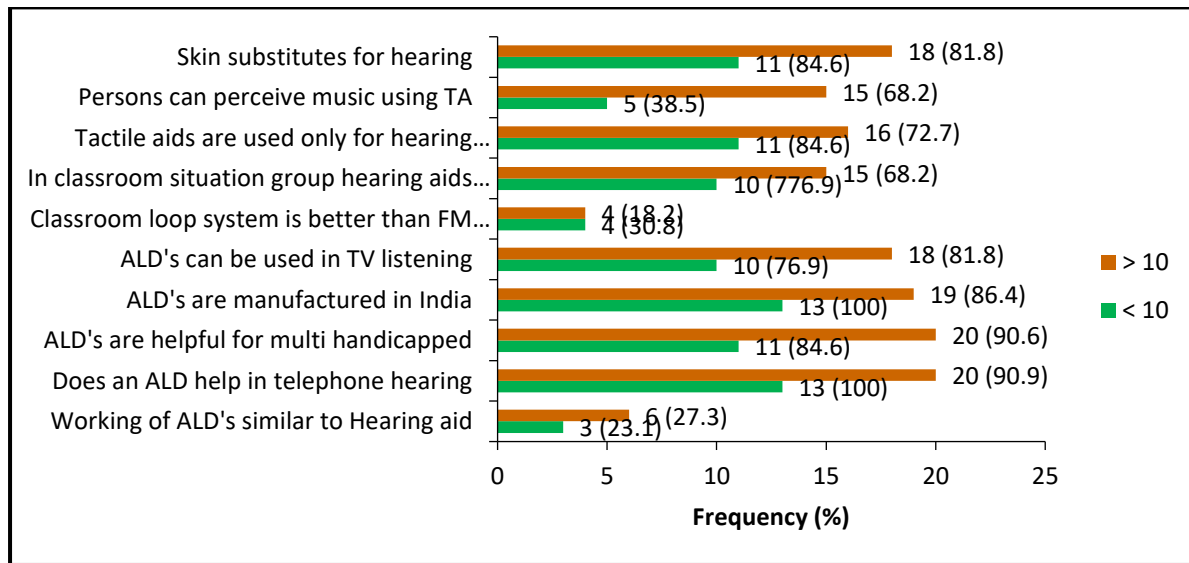


Table 4: Correlation between year of experience and knowledge on ALD for Yes/ No questions.

(n=35)		Experience				Fisher's exact / Chi square test#	p value
		< 10		≥ 10			
		n	%	n	%		
Working of ALD's similar to Hearing aid	Yes	3	23.1	6	27.3	0.302	1.000
	No	10	76.9	16	72.7		
Does an ALD help in telephone hearing	Yes	13	100.0	20	90.9	0.388	0.519
	No	0	0.0	2	9.1		
ALD's are helpful for multi handicapped	Yes	11	84.6	20	90.9	0.344	0.618
	No	2	15.4	2	9.1		
ALD's are manufactured in India	Yes	13	100.0	19	86.4	0.236	0.279
	No	0	0.0	3	13.6		
ALD's can be used in TV listening	Yes	10	76.9	18	81.8	0.311	1.000
	No	3	23.1	4	18.2		
Classroom loop system is better than FM system	Yes	4	30.8	4	18.2	0.222	0.433
	No	9	69.2	18	81.8		
In classroom situation group hearing aids are better than body level hearing aid	Yes	10	76.9	15	68.2	0.266	0.709
	No	3	23.1	7	31.8		
	Yes	11	84.6	16	72.7	0.247	0.680

Tactile aids are used only for hearing impaired	No	2	15.4	6	27.3		
Persons can perceive music using TA	Yes	5	38.5	15	68.2	2.947#	0.086
	No	8	61.5	7	31.8		
Skin substitutes for hearing	Yes	11	84.6	18	81.8	0.352	1.000
	No	2	15.4	4	18.2		

Figure:4 Knowledge (Yes / No) according to years of experience



Correlating the Overall Knowledge and Year of Work Experience:

The second phase, two work experience groups (i.e., <10 years of work exposure and > 10 years of work exposure).

13 (37.1%) participants were less than 10 years of experience and the other 22(62.9%) has more than 10 years of experience. Fisher's exact / Chi square test# is used to find the significance between the year of work exposure and the overall knowledge on questionnaire. By correlating two domains the result shows that the year of work exposure has no significance difference with the knowledge on ALD's.

Discussion

The purpose of the study was to find out how much special education teachers who work full-time with people who have hearing loss know about assistive listening devices. Findings indicate that 74% of special educators who took part in this study are knowledgeable with ALD technology. However, they were not precise when answering some questions, such as which population can use ALDs, which area of the body is suitable for wearing a tactile aid,

which are multi-channel vibro tactile aids, working procedure of ALDs, and which system is superior when comparing classroom loop systems and FM systems. In the second phase, knowledge of ALD was compared with two work experience groups (<10 years of work exposure and > 10 years of work exposure). The results show that there was no significant difference between the two groups.

Conclusion

According to the study findings, it is concluded that special education teachers who work with hearing impaired groups are knowledgeable about assistive listening devices, but they are less accurate in domains such as ALDs functions, other than hearing impaired people who are all eligible to use ALDs. They struggle when the question involves tactile aids. They are less aware of tactile aids because the percentage of the population who use tactile devices on a daily basis is lower, when compared to other devices.

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