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Title	Survey of experiences of people with hearing loss in online settings in Irish academia
Authors	MagShamhráin, Rachel;Kurzmeier, Michael
Publication date	2023-12-04;2023-12-04
Original Citation	MagShamhráin, R. and Kurzmeier, M. (2023) Survey of Experiences of People with Hearing Loss in Online Settings in Irish Academia, University College Cork: College of Arts, Celtic Studies and Social Sciences (CACSS)
Type of publication	Report
Download date	2026-10-31 01:21:40
Item downloaded from	https://hdl.handle.net/10468/15297

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Survey of Experiences of People with Hearing Loss in Online Settings in Irish Academia

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This work was funded under the College of Arts, Celtic Studies & Social Sciences Digital Inclusion Microgrant program.

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Introduction

Virtual conferences, meetings and hybrid events are now commonplace and have in some instances become the new normal for academic events. While virtual events may have the potential to lower access barriers in general, they do not always accommodate hearing impaired participants. While various technical solutions exist, they are not widely used and their quality varies considerably. No study on this topic exists in the Irish context.

Background

In 2022, the College of Arts, Celtic Studies and Social Sciences (CACSSS) issued a call for proposals for projects aiming to enhance awareness and adoption of Digital Inclusion Strategies in Teaching & Learning. Both authors had experienced different approaches to online conferences and meetings throughout the lockdown years, and both had seen the struggle of Deaf or Hearing-impaired colleagues and friends when navigating the plethora of online conference formats and platforms.

From personal experience, both authors were aware of the need to provide appropriate solutions for different levels of hearing loss or auditory hurdle. Additionally, experience in attending and hosting online conferences has shown that speech-to-text solutions in commonly used apps are not able to recognize certain accents, or indeed Irish names, thereby further complicating the potential use of these technologies in an Irish context.

Following a successful application to the CACSSS scheme, the survey project was planned and realized. Through the received funding, the project team was able to hire a student to help administer, run and analyze the survey results. The survey was reviewed and approved by the UCC Ethics Committee for Social Research, application number 2022-188.

Purpose of the study

The study was designed mainly in response to point 4 of the CACSSS call for proposals:

> Assess the needs of students in CACSSS for accessible technologies and digital materials

With the data collected through the above-mentioned survey, we are trying to answer the below questions:

> 1. Understand better the experiences of Deaf and Hard-of-Hearing people in online academic settings
>
> 2. Identify different user needs depending on their specific situation
>
> 3. Understand how useful participants find certain technical solutions/software.

The aim of this project is to review the needs of hearing impaired / Deaf / hard of hearing participants in virtual events, raise awareness for their specific needs and provide organizers with guidance on how to be more inclusive of this group which is an ever-expanding demographic with age-related hearing loss. The project is focussed on the Irish research community, and special consideration is given to the usability of technological solutions in this Irish context.

While it is clear that no single technology can solve problems of inclusion, we believe that listening to and implementing such community feedback as is recorded in this survey can help organizers to consider how to create more inclusive environments.

Methodology

Following ethics approval, the survey was designed in line with Data Management guidelines provided by UCC. The survey was created on the UCC-provided Google environment. All questions were given a sensitivity read by two members of the Deaf and Hard-of-Hearing community. Definitions and levels of hearing loss referenced in some questions are in line with WHO definitions of hearing loss. Except for questions in the *consent* category, participants were free to not answer specific questions and still complete the survey.

The survey was distributed through a range of channels targeting the Irish academic population. This included personal and professional contacts, as well as the UCC Equality, Diversity and Inclusion Newsletter.

The 18 survey questions were divided into eight categories, as shown below

Question No.	Category	Question/Prompt	Answer format
1	Consent	I have read the above statement about the purpose of this study and consent to participate in it.	Yes/No
2	Demographic	Please indicate the year you were born.	Date select (Year)
3	Demographic/Professional Role	I am…	Multiple choice (Student/Academic/Admin/Freetext)

4	Demographics/Gender	What gender do you identify as?	Multiple Choice (Freetext/Male/Female
5	Hearing/Condition	Please indicate how you prefer to self-describe in relation to your hearing.	Multiple Choice (Deaf, Hard-of-hearing, I do not self-describe in relation to my hearing,Freetext)
6	Hearing/History	Please indicate when you first experienced or were diagnosed with hearing loss	Multiple Choice (At birth, During childhood, As an adult)
7	Hearing/Language	Please indicate what your first language is.	Checkbox grid (English, Irish Sign Language, Other)
8	Hearing/Level	Please describe your level of hearing (multiple choice).	Multiple Choice (None, Mild, Severe, Profound, Other)
9	Hearing/Device	Do you use a hearing aid or cochlear implant?	Multiple Choice (Yes, I have and regularly use a hearing aid / cochlear implant; I have one, but only use it in certain situations; I have one, but (almost) never use it; I do not have a hearing aid / cochlear implant; Other.)

10	Hearing/Experience	My experiences in the academic online environment are…	Multiple Choice Grid (My hearing device works well with headphones/laptop speakers; Lip reading is easier in online meetings; I participate more actively in online events)
11	Experience	If I were to choose a form of academic engagement in the future, I would prefer… (multiple choice).	Multiple Choice(Entirely online, Entirely face-to-face, Hybrid Other)
12	Experience	Which of these tools have you used in the past?.	Checkbox Grid (Zoom, Google Meet, Otter.ai, On-Screen sign language, Other)
13	Experience	Which of these improvements would you like to see?	Multiple Choice Grid (Close captions on by default, Option to see the speaker's face even when they share their screen, Q&A through chat as default, Pre-recorded sessions, Sign language interpreting embedded, Other)

14	Experience	What would you say is the biggest benefit or challenge for Deaf or Hard-of-Hearing participants in online academic settings?	Freetext answer
15	Experience	If there are any other non-hearing related factors which complicate your participation in online environments, please note them here. These might include having a quiet place to work, and having necessary equipment and good internet connection.	Freetext answer
16+17	Consent	Would you be willing to be contacted for any follow-up questions?	Yes/No and Email
18	Experience/Open	Is there anything else you would like to share with us?	Freetext answer

Table 1: Comprehensive list of survey questions

Results

The survey received N=41 complete responses. Only these complete responses were included in the results.

Demographics

Out of 41 respondents, 70.7% (29) identified as female, while 29.3% (12) identified as male. This discrepancy in the responses received can not be explained by the study design alone, while it is generally observed that women are more likely than men to respond to survey invitations[1].

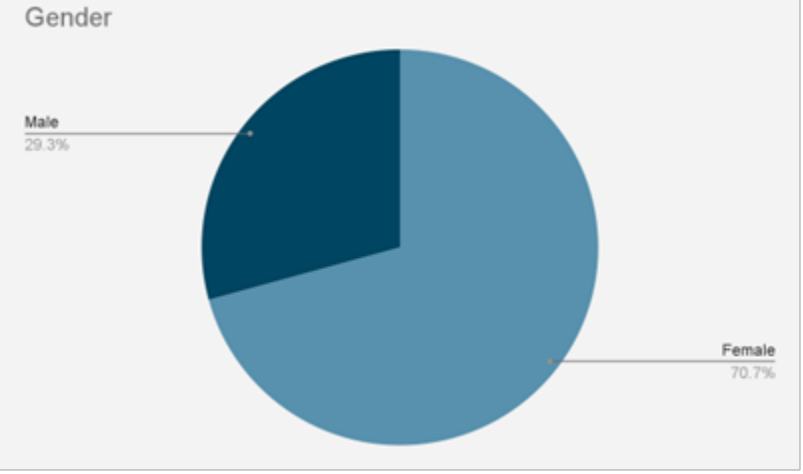


Chart 1: Graph showing the gender of the participants.

The reported age of participants reflects the fact that the survey was aimed at students and/or professionals (broadly 18-65). The high number of respondents in the 35-to-65-year-range can be seen as an indication of a higher number of professional responses over student responses.

[1] See Becker, Rolf. 2017. "Gender and Survey Participation. An Event History Analysis of the Gender Effects of Survey Participation in a Probability-Based Multi-Wave Panel Study with a Sequential Mixed-Mode Design." Methods data (July): 29 Pages. https://doi.org/10.12758/MDA.2021.08.

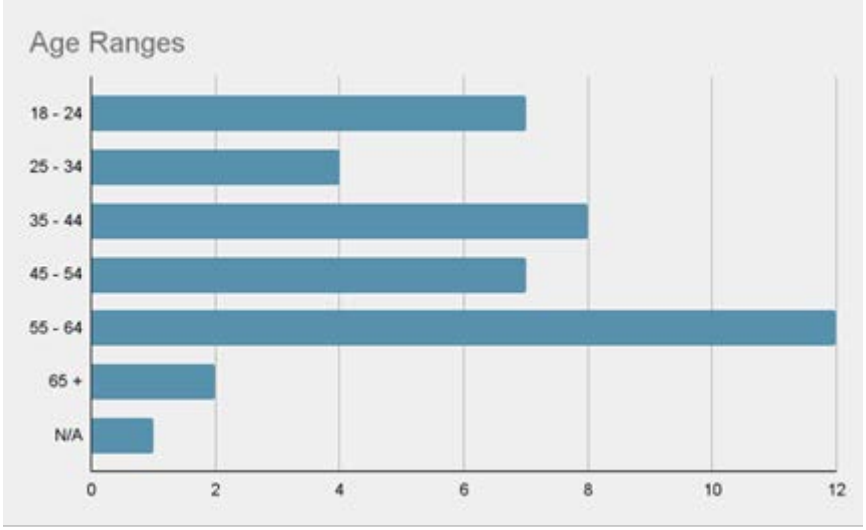


Chart 2: Count years by intervals.

The count of years between 55 - 64 is the highest of all, with 12 participants. Following this first group, the second largest group is 35 - 44 years old, with 8 participants. Both the group of 45 - 54 and 18 - 24 years old have the same number of participants, that is, 7. The group of 25 - 34 is made up of 4 participants while the group of 65 years and older has only two participants. Of the total of 41 respondents, only one participant decided not to include the age. The following is Table 1 which shows the count of participants by age range and gender.

Gender	Age	Total
Female	18 - 24	5
	25 - 34	3
	35 - 44	5

	45 - 54	6
	55 - 64	9
	65 +	1
Total female		**29**
Male	18 - 24	2
	25 - 34	1
	35 - 44	3
	45 - 54	1
	55 - 64	3
	65 +	1

	N/A	1
Total male		**12**
Total		**41**

Table21: Count of participants by age intervals grouped by gender.

The question 3 **I am…** regarding the profession / position of the participant, the survey gave four options: “an Admin”, “an Academic”, “a Student” and a fourth option “Other”, which included a free text field. However, few respondents preferred to specify their jobs instead of grouping them into one of the three sections described in the survey. This gave participants the option to be as specific about their professions as they wished to be. However, this complicates the analysis of the data since, if these answers are not grouped, they have little value in the analysis. For the purpose of the analysis, the answers were grouped where possible. For example: "Journalist" is grouped to Other, "Project Manager in a UCC subsidiary" is an Admin or "Past masters student" is a Student.

Chart 3 shows the participants' answer to question 3. The majority group is student with 15 participants, followed by the academic group with 13 respondents and the admin with 8. Only 4 are grouped under Other and their professions are: retired from teaching, journalist, HR professional and Community Resource officer / advocacy. As in the previous graphs, one respondent prefers not to include the profession.

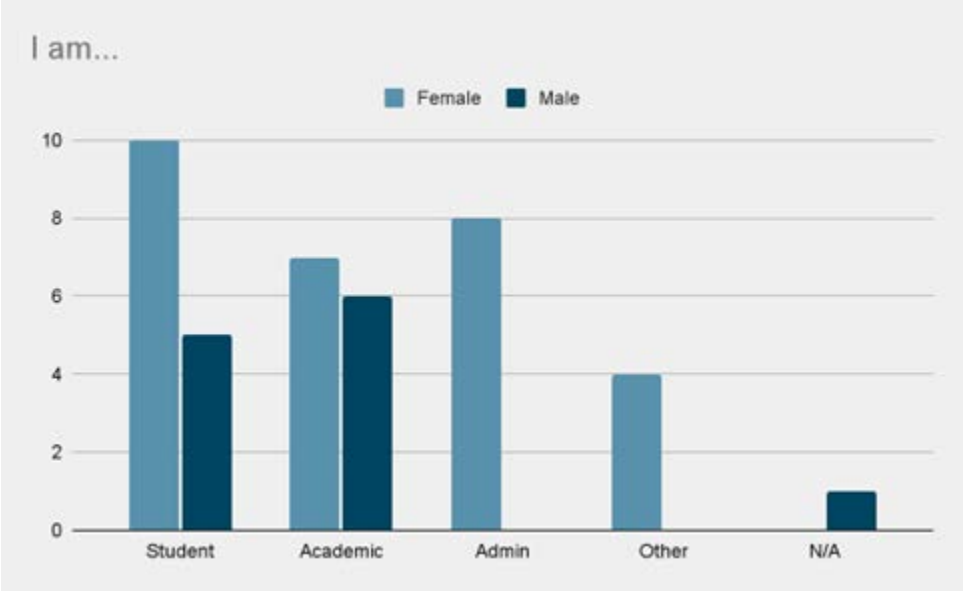


Chart 3: Count the number of participants by profession.

Combining the data from Q3 and Q4 shows a distribution of gender across the professions and gives a more detailed view of the survey respondents.

Gender	Student	Academic	Admin	Other	N/A	Total
Female	10	7	8		4	**29**
Male	5	6		1		**12**
Total	**15**	**13**	**8**	**1**	**4**	**41**

Table 3: Participant count by profession and gender.

The above table shows the female group to be in the majority. This group has more participation in each profession column. There are twice as many students compared to the male group, one more academic and there are no men in the admin group, while there are 8 in the female group.

Level of Hearing impairment

The second group of questions are as follows: the type of hearing loss, when it was first diagnosed, and the first or native language. Q5 asks the respondent **how they would describe their hearing condition**, with the multiple response format being: deaf, hard-of-hearing, I do not self-describe in relation to my hearing and another. As in Q3 on occupation or profession, some respondents preferred to check the “other” box to be more specific. However, some answers belong to the "Hard-of-Hearing" category, such as: "completely deaf in right hear", "partially deaf" or "I have hearing difficulty". To simplify the process and to obtain reliable data, the answers have been grouped where it was clear what group they referred to. Of the total number of respondents, 26 are hard-of-hearing, that is, 63.4%. Regarding the second category, 24.4% are deaf, that is, 10 people. 9.8% (4 participants) chose the answer "I do not self describe in relation to my hearing" and one respondent chose no type of answer. Chart 4 visualizes the distribution of the data.

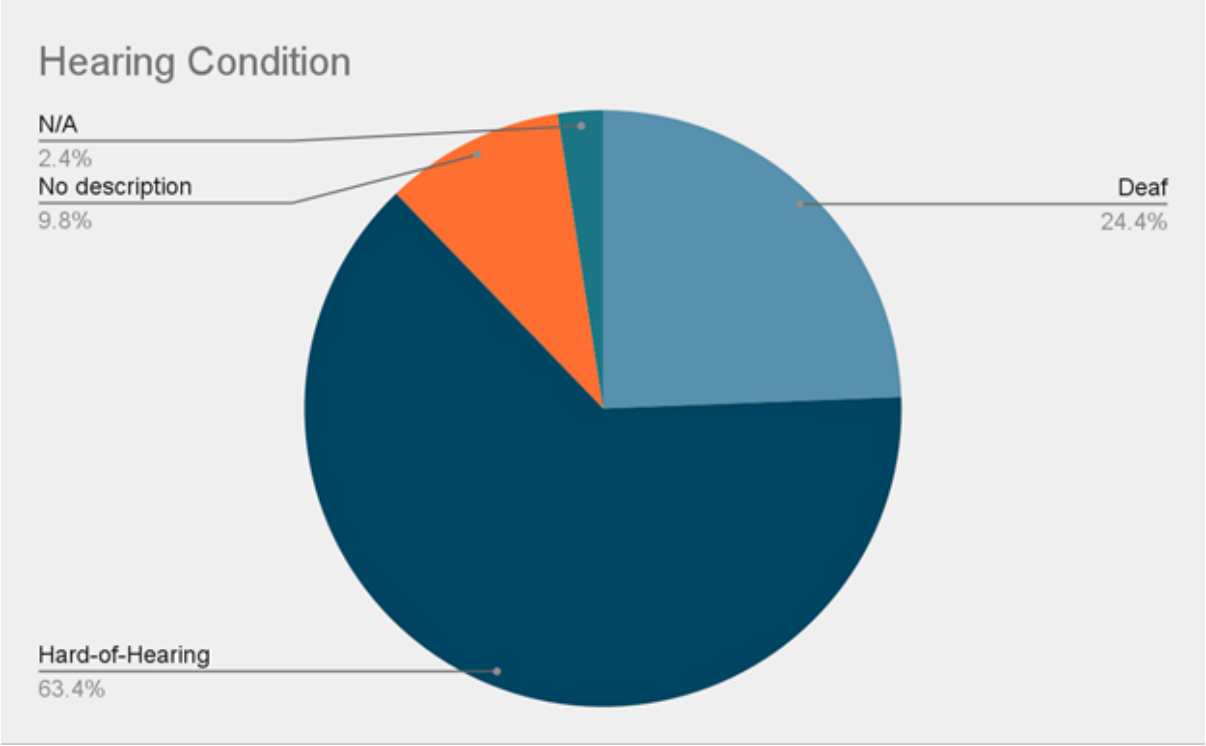


Chart 4: Distribution of responses to Q5 about the hearing condition.

Table 3 shows the different hearing conditions of the respondents according to gender and age range. In the hard-of-hearing column, in both genders a progression can be observed as the respondent's age increases. Although these are not statistically valid data as it is a small sample, we can say that hearing difficulty increases as age increases. There are the same number of deaf people in both genders and that does not indicate any progression with age.

Gender	Age	Deaf	Hard-of-Hearing	No description	N/A	Total
Female	18 - 24	2	3			5
	25 - 34	1	2			3
	35 - 44		5			5
	45 - 54	1	3	2		6
	55 - 64	1	6	2		9
	65 +				1	1

Total female		**5**	**19**	**4**	**1**	**29**
Male	18 - 24	1	1			2
	25 - 34		1			1
	35 - 44	2	1			3
	45 - 54		1			1
	55 - 64		3			3
	65 +	1				1
	N/A	1				1
Total male		**5**	**7**			**12**

Final Count		**10**	**26**	**4**	**1**	**41**

Table 4: Hearing conditions of the participants distributed according to age range and gender.

Q6 about **when the hearing condition was diagnosed for the first time**, has three types of pre-established responses: at birth, during childhood, and as an adult. Chart 5 shows the distribution of the responses, with 9 respondents having hearing conditions since birth (22% of the total), 9 who developed the hearing condition during their childhood and 23 (56.1% of the total) who developed the hearing condition during adulthood. Here the data shows a similar trend as the data in question 5, with hearing loss problems increasing with age since more than half of the respondents lose hearing capacity as age advances.

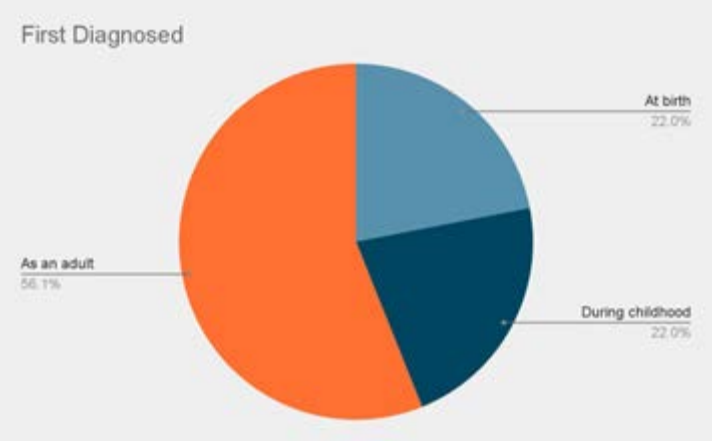


Chart 5: Distribution of responses to Q6 about when first diagnosed with hearing loss.

Table 4 shows the crossing of data from Q6 with gender and age range, since it is important to take into account the age and gender issues of the respondents.

Gender	Age	At birth	During childhood	As an adult	Total
Female	18 - 24	3	2		5
	25 - 34	1	1	1	3
	35 - 44	1	1	3	5
	45 - 54		1	5	6
	55 - 64	1	1	7	9
	65 +			1	1
Total female		**6**	**6**	**17**	**29**
Male	18 - 24	1		1	2
	25 - 34			1	1

	35 - 44	1	1	1	3
	45 - 54	1			1
	55 - 64		1	2	3
	65 +			1	1
	N/A		1		1
Total male		**3**	**3**	**6**	**12**
Total		**9**	**9**	**23**	**41**

Table 5: Data from Q6 about when first diagnosed with hearing loss with gender and age range.

Hearing conditions	At birth	During childhood	As an adult	Total
Deaf	6	2	2	10

Hard-of-Hearing	3	7	16	26
I do not self…			4	4
N/A			1	1
Total	**9**	**9**	**23**	**41**

Table 6: Data from Q6 with the different hearing conditions.

60% of those surveyed were born with their hearing condition, while 20% developed a hearing impairment / hearing loss during childhood and the remaining 20% as an adult. Regarding the population which is Hard-of-Hearing, we observed an increase with the increase of age. 11.54% had hearing difficulties at birth, 26.92% developed them during childhood, while 61.54% developed them as an adult.

Language

Q7 indicates the **first language of the respondent**. Perhaps unsurprisingly, English is the majority with 33 participants, that is, 80.5% of those surveyed. The second largest category was Others with 4 participants, that is, 9.8%. Those specified their languages as Portuguese, Dutch, Hungarian and another language of the European Union. Irish Sign Language accounted for the first language of 7.3% of respondents, i.e. 3 participants. One respondent chose not to include this information in this question. Chart 6 shows the distribution of responses by language. The small number of respondents with first language Irish Sign language does not correspond to the numbers of respondents who identified deafness or being hard-of-hearing as their hearing condition. This question deliberately allowed the participants to decide whether they would identify sign language or spoken language as their first language so as not to

assume that ISL is the first language of people who identify as Deaf or Hard-of-Hearing.

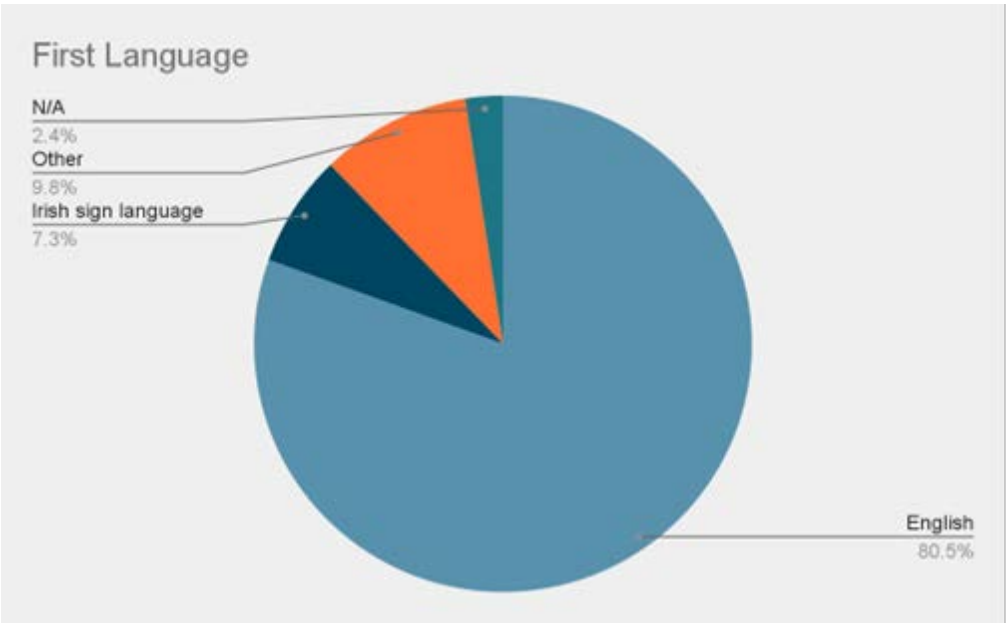


Chart 6: Answers to Q7 about the first or native language.

The following table is the crossing of information between Q7 about the first language with Q5 about the type of hearing condition. As can be seen in table 6, respondents whose first language was Irish Sign Language specify their hearing condition as deafness. Of 33 respondents whose first language is English, 22 specify hard-of-hearing as their hearing condition, that is, 66.67%. Those in the Deaf category whose first language is English represents 18.18%.

First language	Deaf	Hard-of-hearing	Don't describe	N/A	Total
English	6	22	4	1	33
Irish Sign language	3				3

Other	1	3			4
N/A		1			1
Total	**10**	**26**	**4**	**1**	**41**

Table 7: Data crossing of the first language question with the type of auditory situation

Experienced Difficulties

Last of the group of question on hearing condition is Q8 which describes **the hearing level of the respondent** with multiple choices available as answers: Can follow everything with ease and without aid; Mild - quiet conversation and situations with background noise are difficult to understand; Moderate - the quietest sounds you can hear with your better ear are between 41 and 60 dB. Higher volume levels are required for radio and televisions; Severe - the quietest sounds you can hear with your better ear are between 61 and 80 dB. Difficulties with speech and group conversations; comprehension is impossible without amplification; Profound - the quietest sounds you can hear with your better ear are 81 dB or more. Difficult or impossible to hear and understand amplified devices or speech; and a last option of Others. Chart 7 shows the distribution of the data in columns.

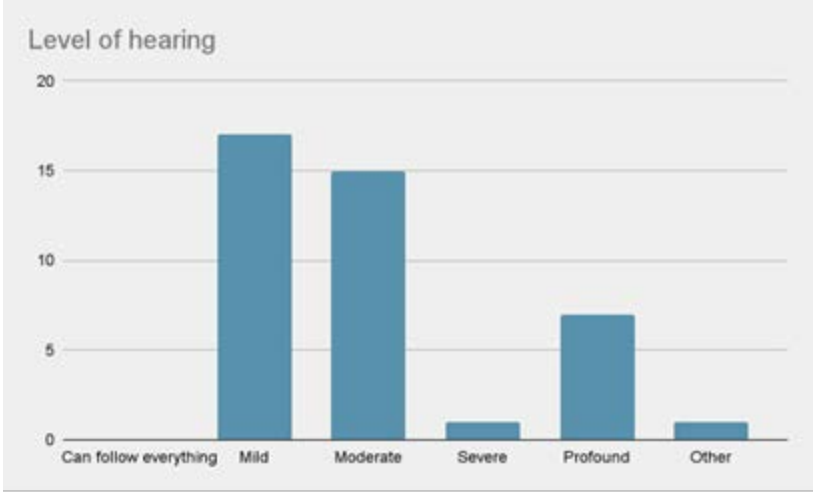


Chart 7: Q8 that indicates the hearing level of the respondent.

A majority group with 17 participants or 41.46% of the total categorized themselves as having Mild loss. A second majority group had Moderate hearing difficulties with 15 participants or 36.59%. Only 1 respondent indicated Severe difficulties, representing 2.44% of the group. Those who identified as having Profound difficulties were 17.07% or 7 participants. In the Other category, one respondent responded "None of the above capture my hearing loss experience". The data for the group of Profound difficulties does not coincide with the total number of respondents who described themselves as “Deaf”, which was 10. This suggest that there are several degrees within the Deaf category, as indicated in the response types (severe and profound), and illustrates the difficulties in nomenclature and in trapping the data accurately.

Table 8 shows the crossing of data from question 8 on hearing level with the data of gender and age range.

Gender	Age	Mild	Moderate	Severe	Profound	Other	Total
Female	18 - 24	1	2		2		5

	25 - 34	1	1		1		3
	35 - 44	1	3	1			5
	45 - 54	2	3			1	6
	55 - 64	7	1		1		9
	65 +		1				1
Total female		**12**	**11**	**1**	**4**	**1**	**29**
Male	18 - 24	1			1		2
	25 - 34		1				1
	35 - 44	1			2		3
	45 - 54	1					1

	55 - 64	2	1				3
	65 +		1				1
	N/A		1				1
Total male		**5**	**4**		**3**		**12**
Total		**17**	**15**	**1**	**7**	**1**	**41**

Table 8: Hearing level of respondents classified according to gender and age.

Finally, Table 9 indicates the hearing level of each participant according to their hearing condition.

Hearing C.	Mild	Moderate	Severe	Profound	Other	Total
Deaf		2		7	1	10
Hard-of-Hearing	15	10	1			26

Don't describe	2	2				4
N/A		1				1
Total	**17**	**15**	**1**	**7**	**1**	**41**

Table 9: Data from question 8 distributed according to question 5.

Distributing the data in this way shows discrepancies between participant's self-reported hearing conditions and their experienced difficulties. For example, two participants who self-identified as *Deaf* reported only moderate hearing difficulties. This might be attributed to the use of hearing aids or lip reading. The question did not specify if the use of hearing aids and techniques was to be assumed or not.

Hearing aids

The third group of questions related to the **type of hearing device** the respondent uses and their experiences in the online academic field. Q9 allowed multiple answers as follows

- Yes, I have and regularly use a hearing aid / cochlear implant;
- I have one, but only use it in certain situations;
- I have one, but (almost) never use it;
- I do not have a hearing aid / cochlear implant;
- Other.

The following chart 8 shows the distribution of the data from question 9. Apie chart is the best way to illustrate the responses. It shows clearly that almost half of the respondents use hearing aid / cochlear implants: 19 respondents, corresponding to 46.3%. There are two groups each with 3 respondents, that is, 7.3% of the total, that have a hearing aid / cochlear implant, however they do not use it or use it only on certain occasions. Significantly, 13 people or 31.7% of those surveyed do not use a hearing aid / cochlear implant despite having a

hearing loss. One respondent decided not to comment and two chose the answer *Other* to indicate they were in the process of getting a hearing aid.

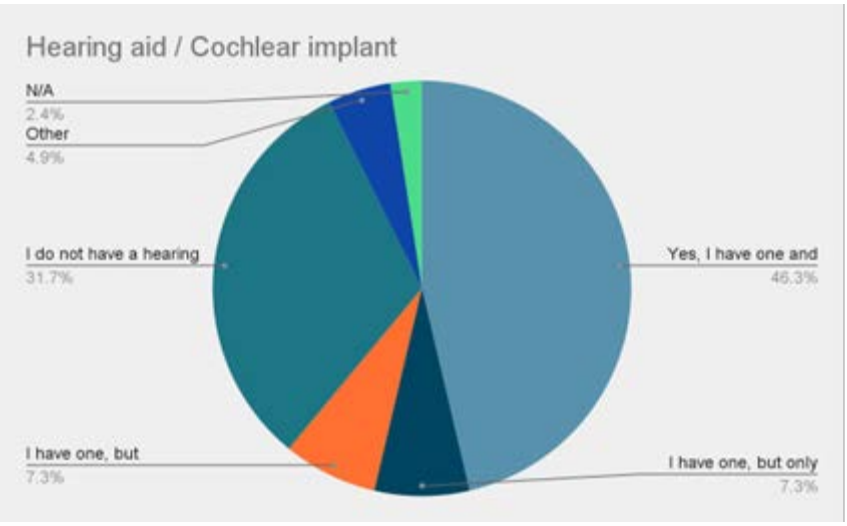


Chart 8: Chart pie with the answers to Q9.

Table 9 shows the crossover of data from Q9 with hearing conditions of the respondents.

Hearing condition	Yes, I have…	I have one, but only…	I have one, but (almost)...	I do not have…	Other	N/A	Total
Deaf	6	2	1	1			10
Hard-of-Hearing	11	1	1	10	2	1	26

I do not self…	1		1	2			4
N/A	1						1
Total	**19**	**3**	**3**	**13**	**2**	**1**	**41**

Table 10: Distribution of data of Q9 with Q5 in relation to the hearing condition.

Table 10 shows a clear trend: 60% of all Deaf respondents have a hearing aid / cochlear implant and use them regularly. Them 30% do have a hearing aid / cochlear implant but they use it on certain occasions or almost never use it. Only 1 respondent, representing 10% of the total in the category “deaf” does not use any type of hearing device. However, the group self-categorized as Hard-of-Hearing, 10 does not use any type of hearing device, representing 38.46% of the total. This last data may indicate that the loss is mild. The population that uses hearing aid / cochlear implant regularly is 42.31%, that is, 11 participants, indicating that their hearing condition is moderate to profound. Only a minimal number, namely 7.69%, have a hearing device that they do not use or only occasionally use, indicating mild hearing loss.

Level of hearing	**Yes, I have…**	**I have one, but only…**	**I have one, but (almost)...**	**I do not have**	**Other**	**N/A**	**Total**
Mild	6	1	1	7	1	1	17

Moderate	7	1	1	5	1		15
Severe	1						1
Profound	5		1	1			7
Other		1					1
Total	**19**	**3**	**3**	**13**	**2**	**1**	**41**

Table 11: Distribution of the data on the type of hearing device used by the population, ordered according to hearing level.

Table 10 above shows clear data in relation to the population that uses some type of hearing device based on hearing level. Of the total number of respondents with a Mild hearing level, i.e. 17, only 6 participants use hearing aid / cochlear implant, or 35.29%. On the other hand, 7 do not use any type of device, or 41.18% of the total respondents with Mild level. Of the total number of participants with a Moderate hearing loss level, i.e. 15, only 7 participants use hearing aid / cochlear implant, representing 46.67%. On the other hand, 5 participants do not use any hearing device, equating to 33.33% of the total of Moderate level. This data indicates the following trend: the milder or more moderate hearing level, the fewer hearing devices respondents use. This trend is confirmed by the fact that of the total number of respondents with a Profound level of hearing loss (i.e. 7), 71.43% use a hearing aid / cochlear implant regularly, that is, 5 participants.

Experience of the respondents in the online academic field

This set of questions refers to the **experience of the respondents in the online academic field**. It is a multiple choice grid offering the following statements from which to choose:

- Online conferences, meetings and classes are easier to follow;
- My hearing device works well with headphones/laptop speakers;
- Lip reading is easier in online meetings;
- I participate more actively in online events.

The participants classified each of the statements with the following criterias:

- To a great extent;
- Unchanged;
- To a lesser extent;
- Not applicable.

Chart 9 represents all the data responses to Q10.

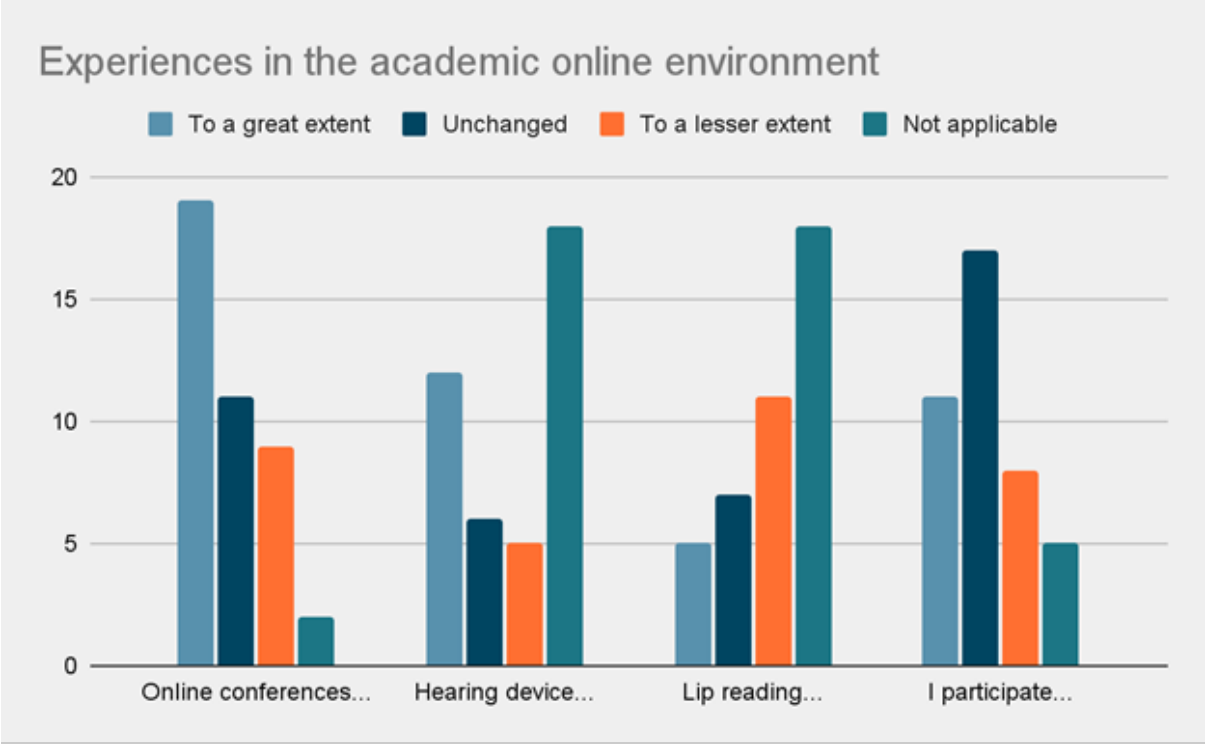


Chart 9: Column chart with the data from Q10.

The following is Table 12, with the classification of all responses to each statement:

	To a great extent	Unchanged	To a lesser extent	Not applicable
Online conferences…	19	11	9	2
Hearing device…	12	6	5	18
Lip reading…	5	7	11	18
I participate…	11	17	8	5

Table 12: Distribution of all responses to question 10.

Of the total, 46.34% find the conferences, classes and online meetings easier to follow, i.e. 19 participants. 21.95% find online conferences, classes and meetings a to a lesser extent. 29.27% of respondents have hearing devices that worked well with headphones and laptop speakers; however, 43.90% chose the Not applicable section. Regarding “Lip reading is easier in online meetings”, 26.83% found this to be the case to a lesser extent. As in the previous statement, an overwhelming 43.90% chose the Not applicable section. The last statement “I participate more actively in online events”, 41.46% did not find any change while 26.83% found that they could participate in online events to a greater extent. Only 19.51% found themselves participating in online events to a lesser extent.

The general result from this overview question suggests that respondents of all levels of hearing loss found online conferences easier to follow, however for most participants their level of participation was unchanged. In the following, these answers will be discussed in more detail.

Table 13 classifies the data of the first statement **"Online conferences, meetings and classes are easier to follow"** with the hearing conditions of the participants.

Hearing condition	To a great extent	Unchanged	To a lesser extent	Not applicable	Total
Deaf	3	2	3	2	10
Hard-of-Hearing	13	7	6		26
I do not self…	2	2			4
N/A	1				1
Total	**19**	**11**	**9**	**2**	**41**

Table 13: Distribution of data of the first statement of Q10 with hearing conditions of the respondent.

Of the respondents who classified themselves as deaf, 30% found online conferences and classes easier to follow while another 30% allocated this a lower grade, indicating that the online environment only helped to a lesser extent. 20% did not see any change and another 20% chose the "Not applicable" box. From the Hard-of-Hearing category, 50% of respondents in this condition chose the "To a great extent" box, indicating a significant benefit to online meetings, while 26.92% saw no change either positive or negative, with the remaining 23.08% choosing "To a lesser extent". In the "To a great extent" category, 68.42% were Hard-of-Hearing, thus indicating that the majority of respondents in this group handle online conferences, classes and meetings more easily. **The data shows that Hard-of-Hearing participants mostly found online venues more accessible, while Deaf participants show more mixed reactions to online conferences.**

The following is Table 13 with the distribution of responses to the second statement, i.e. **"My hearing device works well with headphones/laptop speakers"**, with the hearing condition of Q5.

Hearing Condition	To a great extent	Unchanged	To a lesser extent	Not applicable	Total
Deaf	2	2	1	5	10
Hard-of-Hearing	8	3	4	11	26
I do not self…	1	1		2	4

N/A	1				1
Total	**12**	**6**	**5**	**18**	**41**

Table 14: Sorting of data of the second statement of question 10 with hearing conditions of the participants.

Of the population in the Deaf category, 50% chose the Not applicable option. While 20% reported that their hearing device works well with headphones and laptop speakers (“To a great extent”), another 20% did not see any alteration (“Unchanged”) and 10% indicated that their hearing device worked well with headphones and laptop speaker “To a lesser extent”. In the Hard-of-Hearing row, an overwhelming 42.31% chose the “Not applicable” option while 30.77% chose “To a great extent”. 15.38% found “To a lesser extent” that their hearing devices were compatible with headphones and laptop speakers, while the remaining 11.54% chose the “Unchanged” option. From the “To a great extent column”, 66.67% of respondents were Hard-of-Hearing. From the “Not applicable” column, 61.11% of the responses belong to the Hard-of-Hearing category.

This data indicates that the use of hearing-device compatible technology (microphone / speakers) during online interactions is mixed. This data is problematic as further follow-up would be required in order to understand why the participants who indicated poor compatibility between hearing device and headphones / speakers did so. It is possible that the do not have devices which are compatible with the computer used, or that they did not require such compatibility. A better question might have been whether computer sound (either speakers or headphones) was a central factor in their online experience. This might have been followed by an open field in which participants could explain why. The poverty of the data here lies in the survey design, but might suggest better survey questions for the future.

In the next section, participants were asked to evaluate whether "Lip reading [was] easier in online meetings". The table below shows participants’ evaluations in relation to the types of hearing conditions of Q5.

Hearing condition	To a great extent	Unchanged	To a lesser extent	Not applicable	Total
Deaf	1		3	6	10
Hard-of-Hearing	4	6	7	9	26
I do not self…		1	1	2	4
N/A				1	1
Total	**5**	**7**	**11**	**18**	**41**

Table 15: Classification of data of the third statement of question 10 with hearing conditions of the respondent.

As can be seen, a considerable number of responses are in the “Not applicable” column: 43.90% of the total responses of those surveyed. Of those 18 participants, 50% self-described as Hard-of-Hearing and 33.33% self-described as Deaf. Of the 10 Deaf respondents, only 10% found lip reading easy in online settings; while 30% had more difficulties with lip reading in online academic environments. Of the 26 Hard-of-Hearing-respondents, 15.38% found it easier to read lips in online classes, while 23.08% chose the “Unchanged” box and the remaining 26.92% found lip reading easier only “To a lesser extent” in online academic environments. Of 11 respondents who chose "To a lesser extent", 63.64% were Hard-of-Hearing.

Table 15 below presents the data in relation to the fourth and last statement **"I participate more actively in online events"** according to the types of hearing loss indicated in Q5.

Hearing condition	To a great extent	Unchanged	To a lesser extent	Not applicable	Total
Deaf	3	3	1	3	10
Hard-of-Hearing	7	10	7	2	26
I dont self…	1	3			4
N/A		1			1
Total	**11**	**17**	**8**	**5**	**41**

Table 16: Data relating to the fourth statement in question 10 according to hearing conditions of the participants.

Of the 10 Deaf respondents, 30% felt they could participate more actively in online events while 10% participated less. The remaining 60% was split evenly

between the "Unchanged" and "Not applicable" columns. Of the 26 Hard-of-hearing respondents, 38.46% chose the "Unchanged" box. 26.92% participated actively in online events while another 26.92% participated less actively. Only 7.69% chose the "Not applicable" box. Of those who chose the "Unchanged" box, 58.82% were Hard-of-Hearing while in the "To a lesser extent" column they represented 87.5% and in the "To a great extent" column they accounted for 63.64%.

Preferred online environments

This group of questions recorded participant attitudes towards different modalities and structures for online academic environments. The first one had a multiple choice answer and the second one, on the other hand, is a checkbox grid with 6 different statements. The following is Chart 10 and shows the responses to Q11: **If I were to choose a form of academic engagement in the future, I would prefer…** This question has 3 types of answers: “Entirely online”, “Entirely face-to-face” and a third option “Other” where the respondent can specify.

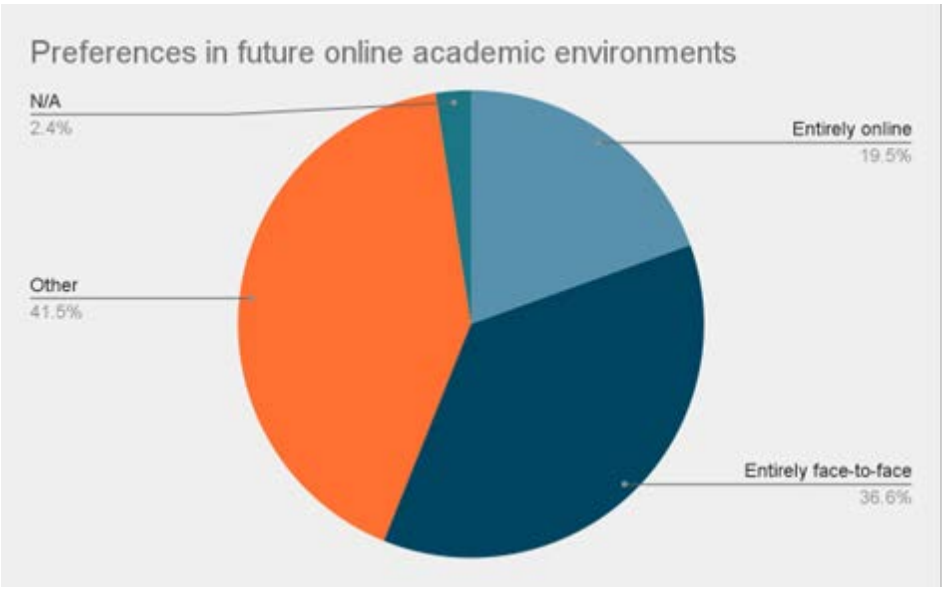


Chart 10: Data from Q11 about future online academic preferences.

Of the 41 respondents, 17 chose the answer "Other" while "Entirely face-to-face" was chosen by 15. 8 respondents wanted entirely online classes are 8 while 1 participant did not specify. During the study design, we deliberately did not

include a *hybrid* option, as it was felt to be too vague. Instead, respondents were able to outline briefly what online meeting/conference structure they felt worked best for them. Most of the respondents expressed their desire for a hybrid option: a mix between online and face-to-face classes. The following are the comments of "Others", partially redacted to remove personal information:

1. I think it would depend on the context and the content.
2. Mixed.
3. A blend of the two.
4. Hybrid of the two or choice.
5. Online with (correct transcription in real time would be better than face to face in large settings.
6. Mixture - but this is more from a sociability perspective than a hearing perspective.
7. Mixed.
8. A choice between both.
9. I prefer to lecture in person but prefer meetings online.
10. Combination of online & face to face.
11. Some online and some face-to-face.
12. 50-50.
13. Depends on the class. [in-person where the focus is on speaking, online where the focus is on writing]
14. Mix of both.
15. Mixed methods.
16. Partly online, mostly face to face.
17. Both; As long as interpreters are available.

Of the 17 respondents in the "Others" category, 13 wanted a hybrid option, combining face-to-face and online elements. In other words, and going back to Chart 10, 31.71% of the participants wanted the combination of two possibilities. In Chart 11 below, the from question 11 is updated to indicate the preference for hybrid.

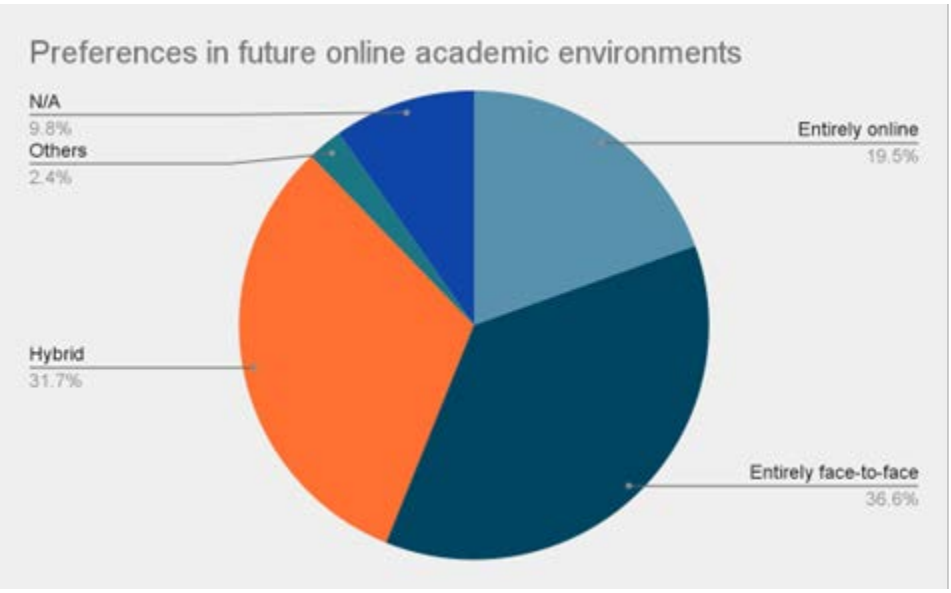


Chart 11: Inclusion of "Hybrid" modality data in Q11.

Of the respondents who chose to indicate their own preference, one said they would prefer online but with correct transcriptions while the other said they preferred both or either modalities, as long as interpreters are available. The following Table 16 crosses data from Q11 with data from Q5 on the hearing loss of the respondents, with the intention of finding out if the degree of hearing loss may influence the preferred modalities of the participants.

Level of hearing	Entirely face-to-face	Entirely online	Hybrid	Other	N/A	Total
Deaf	4	1	4	1		10
Hard-of-Hearing	10	4	8	3	1	26
I do not self…		3	1			4

N/A	1					1
Total	**15**	**8**	**13**	**4**	**1**	**41**

Table 17: Data from Q11 ordered according to the different hearing conditions of the respondents.

Of the 10 Deaf respondents, 40% preferred face-to-face and another 40% a hybrid modality. Only 10% preferred online modality and the remaining 10% preferred another type of modality. Of 26 Hard-of-Hearing respondents, 38.46% preferred face-to-face modality, 15.38% preferred entirely online and 30.77% preferred a hybrid modality. 11.54% preferred another type of modality and 3.85% decided not to specify.

The results show that in both groups that self-describe as having a hearing impairment, in-person or hybrid concepts are preferred over online venues. Where reasons were given, answers related to the social aspect as well as being contingent upon the availability of transcriptions or interpreters.

Q12 collects information about **what software or digital tools respondents have used in the past**. The response type is checkbox grid, which gives 6 statements which are to be marked as Often, Sometimes or Never. The statements provided were the following:

- Zoom,
- Google Meet,
- Teams,
- Closed Captioning Services such as Otter.ai,
- On-screen sign language interpreting
- Other.

Chart 12 shows a column chart with the data of the respondents.

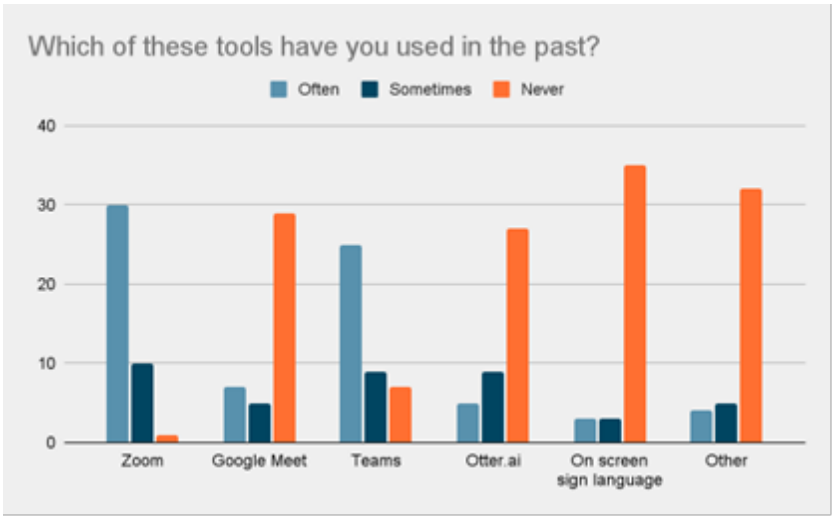


Chart 12: Data from Q12 in relation to programs used in the past.

The Zoom video call program was the most used with 30 respondents indicating "often", 10 using it sometimes and 1 participant never using it. The Google Meet program was never used by 29 participants, 5 indicated they had used it at some time while 7 often used it. The Microsoft Teams program was often used by 25 respondents, from time to time by 9, while 7 never used it. Otter.ai was never used by 27 respondents, 9 used it from time to time and 5 used it often. On-screen sign language was not used by 35 participants, 3 availed of it from time to time, while 3 used it often. The survey did not specify the names of programs in the category Other, 32 indicated never using them, 5 occasionally and 4 often. This last data is of marginal use as it does not specify the program. In terms of percentages, we see that 73.17% often used Zoom. 70.73% of those surveyed said they have never used Google Meet as a video call program. As for the Microsoft version, 60.98% had used it often. 65.85% had never used Otter.ai, despite its being a voice transcription application. 85.37% said they have never used on screen sign language. In the Other section, 78.25% chose the option never.

While it is not surprising that respondents are generally familiar with the most popular online meeting tools (many competing programs were omitted for brevity), it is worth noting that other than Zoom and Teams, participants are seem unfamiliar with other tools and programs. This includes Google Meet, which offers very good speech-to-text recognition, as well as third-party speech recognition systems. More advanced services, such as sign language interpreters, were hardly ever used by respondents. This may indicate the lack of provision of such services due to price / complexity of organization / lack of awareness. Significant in this context is the video quality of the most popular programmes. It would be interesting to follow up with those who use on-screen

ISL interpreting to ascertain which programme (Zoom or Teams) offered the best video quality for ISL. Anecdotally, zoom appears to be the ISL interpreter's preference.

Improvements

Q13 of the survey ask **which of these improvements would you like to see?** It used the same format as Q12 and Q10 above. In other words, there are various statements which the respondents are asked to classify. The statements were:

- Close captions on by default
- Option to see the speaker's face even when they share their screen
- Q&A through chat as default
- Pre-recorded sessions
- Sign language interpreting embedded.

The classificatory categories were as follows:

- Yes, that would be very useful,
- Maybe useful
- Don't think this would help me
- Can't say

The following Chart 13 shows the answers about "**Close captions on by default"**:

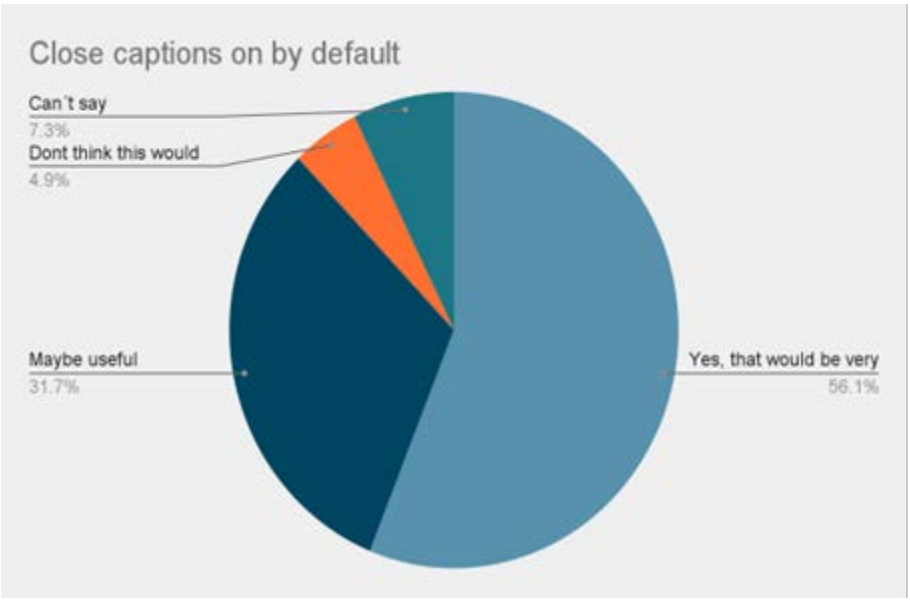


Chart 13: Respondent data on improvement offered by “Closed captions on by default”.

A total of 23 people felt that close captions on by default would be very useful while 13 thought it might be useful. 3 participants could not say while 2 believed that it would not help.

Regarding the **"Option to see the speaker's face even when they share their screen"**, responses are shown in chart 14 below:

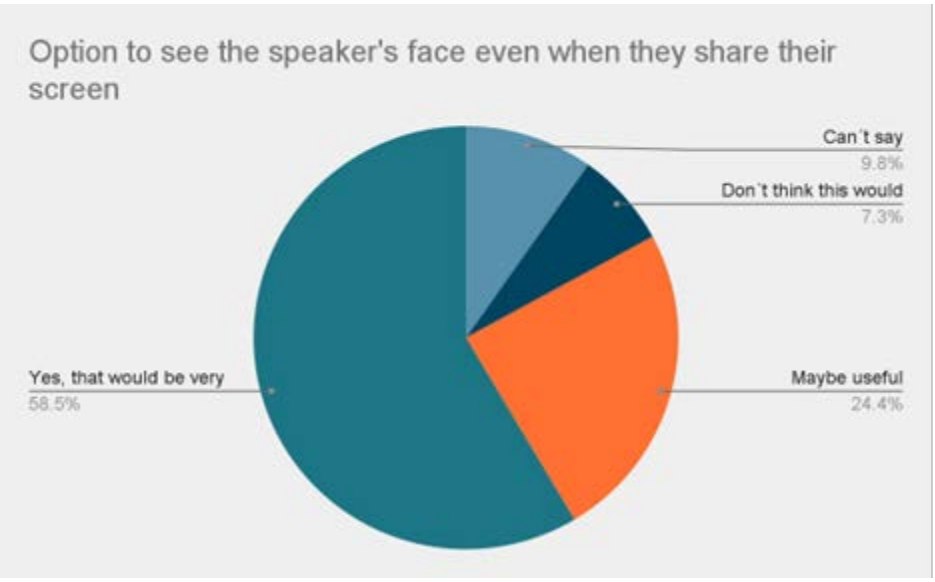


Chart 14: Data relating to the statement “Option to see the speaker's face even when they share their screen”.

In relation to this second statement, a total of 24 people believed that an option to see the speaker's face even when they shared their screen would be useful, while 10 thought that it might be useful. On the other hand, 4 participants could not say while 3 believed that it would not help.

In chart 15 below, reactions to **"Q&A through chat as default"** are presented in pie chart form:

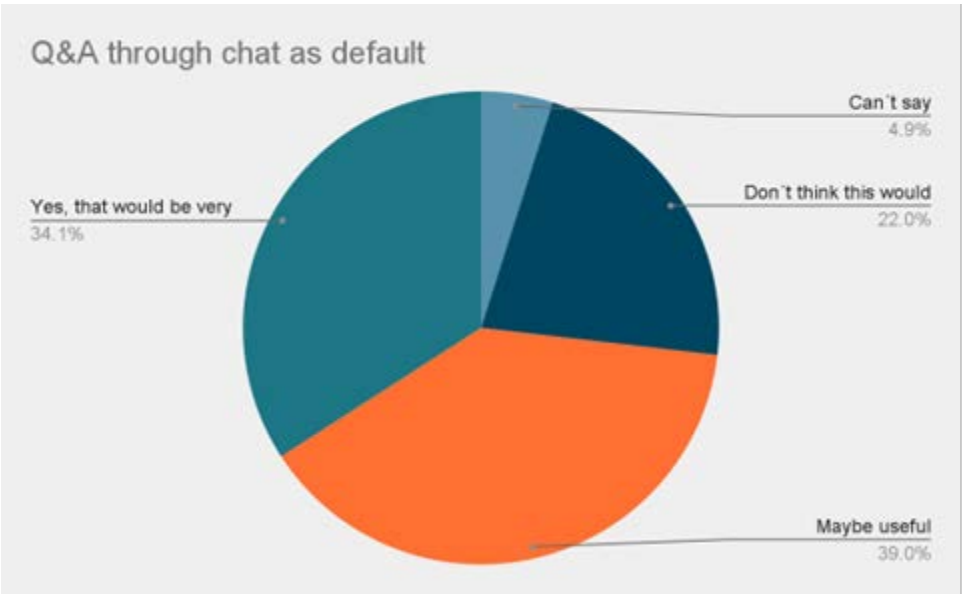


Chart 15: Answers to “Q&A through chat as default”.

In this case, a total of 14 people believed that the Q&A through chat as default option would be useful while 16 thought it might be useful. On the other hand, 2 participants could not say and 9 believed that it would not help.

Chart 16 shows the data on the perceived benefits of **"Pre-recorded sessions"**

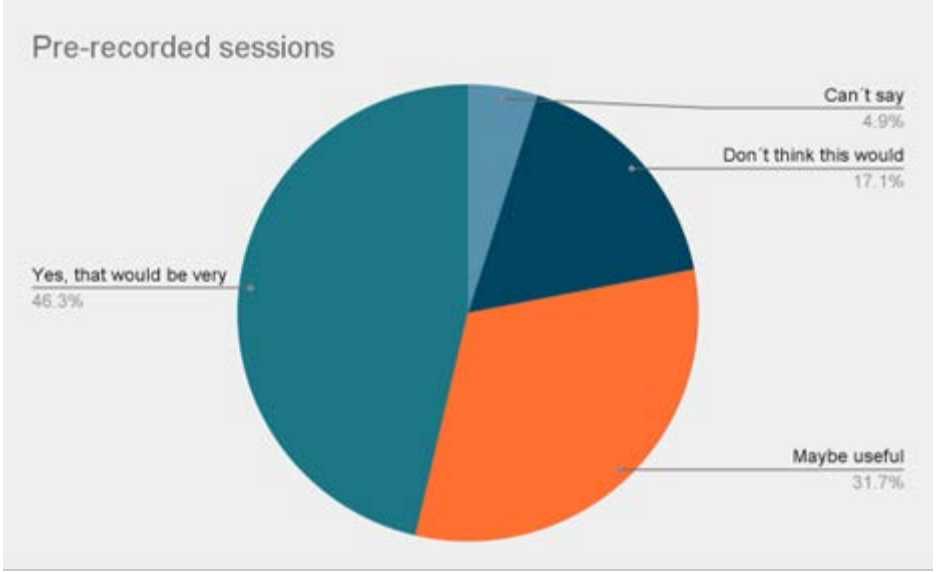


Chart 16: Responses to "Pre-recorded sessions".

In this fourth case, a total of 19 people believed that the pre-recorded session would be useful while 13 thought it might be useful. On the other hand, 2 participants could not say and 7 believed that it would not help.

Chart 17 presents participants' assessment of **"Sign language interpreting embedded"**

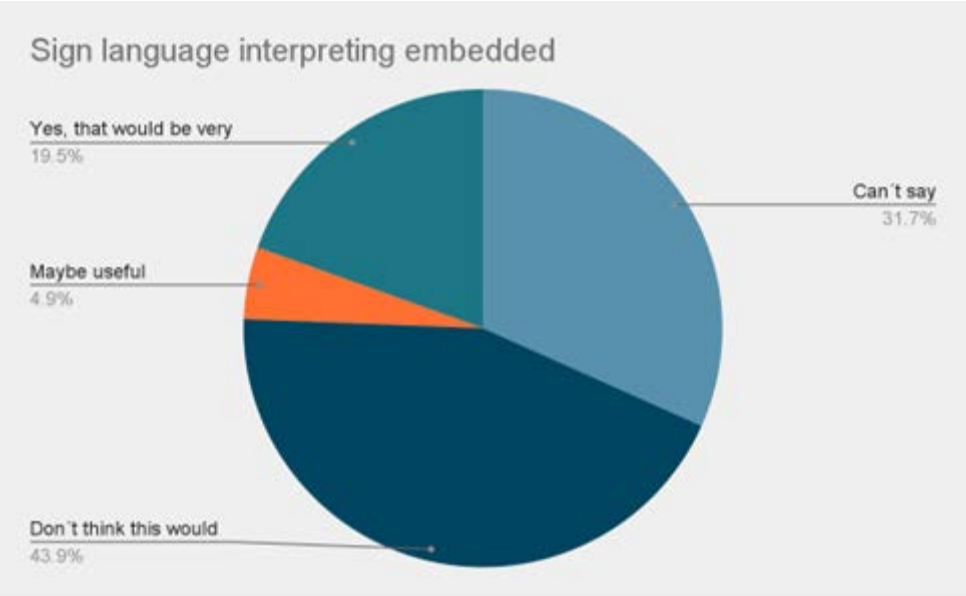


Chart 17: Data on benefit of "Sign language interpreting embedded".

In this case, a total of 8 people believed that the embedding of sign language interpreting would be useful while 2 thought it might be useful. On the other hand, 13 participants could not say and 18 believed that it would not help. In the following tables I cross-reference the data from question 13 on the improvements that the participants would like to see, with data from Q5 on the hearing conditions of the respondents with the aim of finding out if the hearing condition indicated has a bearing on the responses to question 13.

Table 17 shows the data on possible improvements with **"Closed captions on by default"** in relation to the hearing conditions indicated by the respondents.

Hearing condition	Can´t say	Don´t think this would help me	Maybe useful	Yes, that would be very useful	Total

Deaf	1		2	7	10
Hard-of-Hearing	1	2	8	15	26
I do not self…	1		2	1	4
N/A			1		1
Total	**3**	**2**	**13**	**23**	**41**

Table 18: Data from the first statement of Q13 with the hearing conditions of the respondents.

From this data, a small fraction of the overall respondents don't think “Closed captions on by default” would help. In the “Maybe useful” column, 61.54% identified as Hard-of-Hearing while 15.38% self-described as Deaf. From the “Yes, that would be very” useful column, 65.22% identify as Hard-of-Hearing while 30.43% identify as Deaf. Of the total number of Deaf respondents, 70% think that "Closed captions on by default" would be very useful. Of the total number of Hard-of-Hearing-respondents, 57.69% think that "Closed captions on by default" could be very useful. Only 30.77% believed that this might be useful.

Improvements such as “Closed captions on by default” therefore have majority support across the range of hearing loss levels. Conference and online meeting organizers should therefore always be aware of both the quality and availability of closed captions and make sure all participants are aware of this functionality and its availability.

Table 18 below tabularizes the data regarding the **"Option to see the speaker's face even when they share their screen"** in relation to the hearing condition specified by the respondents.

Hearing Condition	Can´t say	Don´t think this would help me	Maybe useful	Yes, that would be very useful	Total
Deaf	1		2	7	10
Hard-of-Hearing	3	3	6	14	26
I do not self…			2	2	4
N/A				1	1
Total	**4**	**3**	**10**	**24**	**41**

Table 19: Data on perceived benefit of “see[ing] speaker’s face even when they share their screen” crossed with the hearing conditions of the respondents.

The total number of respondents who do not believe that "Option to see the speaker's face even when they share their screen" would be helpful is minimal (as in relation to the first statement): 9.76% cannot say and 7.32% believe that this would not be helpful. From the "Maybe useful" column, 60% are Hard-of-Hearing and 20% are Deaf, while the remaining 20% do not describe themselves in relation to a hearing condition. From the "Yes, that would be very useful" column, 58.33% are Hard-of-Hearing while 29.17% are Deaf. Of the total of

Hard-of-Hearing respondents, 53.85% believe that the "Option to see the speaker's face even when they share their screen" would be useful, while 23.08% believe that it may be useful. Of the total Deaf participants, 70% believe that it would be useful and 20% that it may be useful. The data clearly shows that the respondents who are Deaf and Hard-of-Hearing consider the "Option to see the speaker's face even when they share their screen" to be (potentially) beneficial.

This suggests that seeing a speaker's face at all times is essential for participants with hearing loss in online environment. Organizers should take note of this and make sure speakers are clearly visible (and their screen boxes large enough) at all times, especially when sharing their screen.

Table 20 crosses the data on the perceived benefit of **"Q&A through chat as default"** with the self-reported hearing conditions of the respondents.

Hearing condition	Can't say	Don´t think this would help me	Maybe useful	Yes, that would be very useful	Total
Deaf	2	3	4	1	10
Hard-of-Hearing		6	8	12	26
I do not self…			3	1	4
N/A			1		1

Total	**2**	**9**	**16**	**14**	**41**

Table 20: Data from the third statement of Q13 cross-referenced with the hearing conditions of the respondents.

At first glance, we see that there is a progression in the data in the "Don't think this would help me" column compared to tables 18 and 17. Here 21.95% think that "Q&A through chat as default" would not be of help, of which 14.63% are Hard-of-Hearing respondents and 7.32% with Deaf respondents. The "Maybe useful" column represents 39.02% of the total respondents, with 19.51% Hard-of-Hearing and 9.76% Deaf of the total. The column "Yes, that would be very useful" represents 34.15% of the total respondents, with 29.27% in the Hard-of-Hearing category Of the total number of Deaf respondents, 40% believe that "Q&A through chat as default" may be useful while 30% believe that it would not help them. Of the total Hard-of-Hearing respondents, 46.15% believe that it would be useful and 30.77% that it could be useful. However, a considerable 23.08% think that it would not be useful.

Having the Q&A session through that chat as default was preferred across respondents in this survey. Organizers should be aware that Hard-of-Hearing participants may prefer to use the chat function for questions. The factors which might impinge upon the preference for or against this Q&A format were not trapped by this survey but would be useful.

Table 21 shows the data relating to the perceived benefits of **"Pre-recorded sessions"** cross-referenced with the self-reported hearing loss category of the respondents.

Hearing condition	**Can´t say**	**Don´t think this would help me**	**Maybe useful**	**Yes, that would be very useful**	**Total**
Deaf	2		4	4	10

Hard-of-Hearing		5	7	14	26
I do not self…		1	2	1	4
N/A		1			1
Total	**2**	**7**	**13**	**19**	**41**

Table 21: Data from the fourth statement of Q13 crossed with the hearing category of the respondents.

Of the total number of respondents, 46.34% believe that "Pre-recorded sessions" would be useful, while 31.71% think they might be useful. On the other hand, 17.07% think that it would not be useful and 4.88% cannot say. Of the Hard-of-Hearing respondents, 53.85% think that pre-recorded sessions would be useful. 26.92% believe that they might be useful, while 19.23% think that it would not help them. Of the total number of Deaf respondents, 40% believe that it might be useful, another 40% that it could be useful while the remaining 20% cannot say.

As for "Pre-recorded sessions", a considerable number of respondents with the Deaf or Hard-of-Hearing condition absolutely think that it would help and a smaller amount that it could help. Pre-recorded sessions (which implies the option to stop and re-watch the video) were slightly to strongly preferred by all levels of hearing-impaired participants. This of course begs the question of the quality of pre-recorded sessions and the further question of interactive loss when using recordings over live sessions.

Table 22 shows the data on perceived benefits of having**"Sign language interpreting embedded"** in relation to the hearing conditions of the respondents.

Hearing condition	Can´t say	Don´t think this would help me	Maybe useful	Yes, that would be very useful	Total
Deaf	1	5		4	10
Hard-of-Hearing	11	11	1	3	26
I do not self…	1	1	1	1	4
N/A		1			1
Total	**13**	**18**	**2**	**8**	**41**

Table 22: Data from the fifth statement of Q13 crossed with the hearing categories of the respondents.

Of the total number of respondents, 43.90% believed that "Sign language interpreting embedded" would not help, 31.71% could not say, while 19.51% thought that it would help. Only a very minimal 4.88% believed that it might possibly help. Of the total number of Deaf respondents, 40% believed it would help while 50% believe it would not. Of the total number of Hard-of-Hearing respondents, 26.83% could not say while another 26.83% believed that it would not help. Only 7.32% believed that it would be useful. In this table we have considerable numbers who think that "Sign language interpreting embedded" would not help and who cannot say. Only a small percentage believe that it would help.

Participants did not express strong positive notions towards the use of embedded sign language. This may be due to the fact that only a small

percentage of participants described sign language as their first language. Also, the use of sign language in online settings was largely unknown amongst participants (see Q12). It may also have to do with the limitations upon effective sign-language interpreting in on-line environments (internet speed; video quality differences etc.).

Challenges

This last group of questions is related to the benefits / challenges and other related factors. Question 14 is **"What would you say is the biggest benefit or challenge for Deaf or Hard-of-Hearing participants in online academic settings?"** with the possibility of a short and open answer. Regarding question 15: "If there are any other non-hearing related factors which complicate your participation in online environments, please note them here. These might include having a quiet place to work, and having necessary equipment and good internet connection" as well with the short and open answer style. In this last part the respondent has written personal answers in relation to his own Deaf / Hard-of-Hearing experience.

For analysis, the results were grouped them into the following 10 categories: Issues following online classes / background noise; Events or staff not adapted to people with hearing conditions; Good online communications; Lack of body language / Lip reading; Possibility to adjust volume / subtitles; Use of pre-recorded sessions; Not related to hearing loss, and N/A.

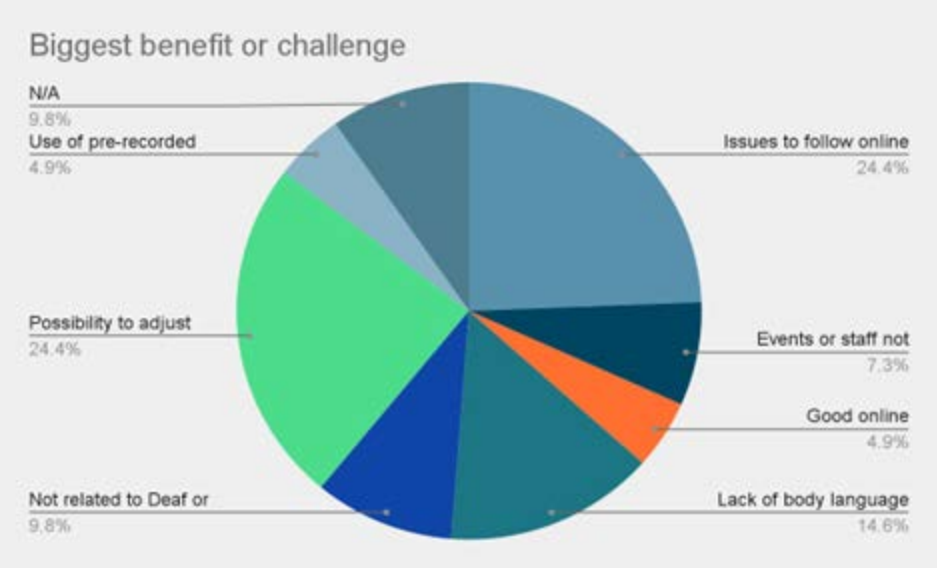


Chart 18: Data from question 14 "What would you say is the biggest benefit or challenge for Deaf or Hard-of-Hearing participants in online academic settings?"

Some of the responses gave reasons unrelated to hearing loss. For example, some participants allude to computer issues not specifically related to any hearing condition. Nevertheless, these are interesting issues to note, as technology is often perceived as a panacea to access issues.

There were 10 participants who considered the ability to adjust volume in an online setting and to have subtitles to be a great benefit that the virtual environment allows. 10 responses could be grouped under the category "Difficult to follow online classes / background noise". There were 6 people who considered the limitations on body language / lip reading in online classes to be a challenge. Online classes mean not having physical contact, so body language disappears, leaving Deaf people who rely on these modes of expression at a loss. 3 respondents believed that “Events or staff are not adapted to people with hearing conditions” and here the following responses are especially worth mentioning:

> “Ignorance among colleagues of hearing loss. Inability of colleagues to understand adaptations needed”
>
> “Not all events take under consideration that there would be attendees with special needs - that a little louder speaker would benefit a lot”
>
> “Lack of awareness among staff & inconsideration”.

3 respondents believed that there is good communication in online events and 2 believed that the availability of recorded sessions is beneficial. 4 respondents fell into the category of "Not related to Deaf or Hard-of-Hearing conditions" and 4 other people preferred not to answer.

Last of this group is Q15: **"If there are any other non-hearing related factors which complicate your participation in online environments, please note them here. These might include having a quiet place to work, and having necessary equipment and good internet connection"**.

In this section the responses have been categorized the responses into 5 groups:

- Essential to have equipment
- Good internet and a quiet place
- Easily distracted

- Hearing aid is incompatible with the online modality
- Poor visibility and lack of interpersonal interaction
- N/A.

Chart 19 shows the distribution of the data in pie chart format

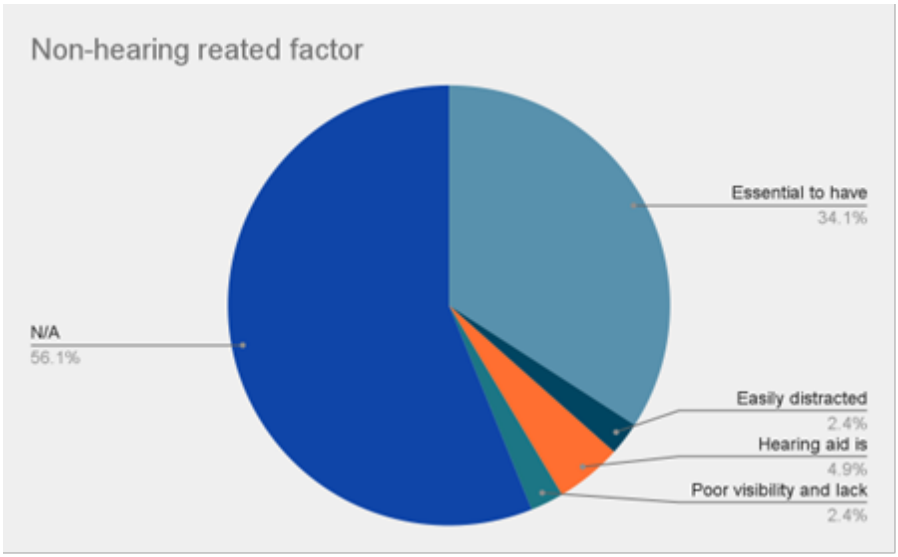


Chart 19: Data from Q15.

23 respondents did not answer this question and 14 indicated that it is important to have a good computer, good internet and a quiet place. Two respondents expressed that their hearing aid is incompatible with the online modality, 1 person found themselves easily distracted and 1 believed that there is poor visibility and lack of interpersonal interaction in online events.

The final question (Q18) gave respondents the opportunity to comment freely on any hearing-related issues: **“Is there anything else you would like to share with us?”**. A total of 9 people wrote a comment while the rest did not respond or briefly responded that there was nothing to comment. Some answers have been redacted to protect respondent’s privacy:

1. [...] All my teaching has been face-to-face with no online teaching yet. My hearing has deteriorated within the last year and I have recently been fitted with hearing aids.
2. Delighted that this is being considered.

3. I haven't been diagnosed with a hearing problem - just my own observations of difficulty hearing in busy environments/ multi people conversations.
4. A small informal campaign warning everyone about these special simple needs would be nice.
5. The lived experience of being deaf is unique to each person in my experience and this survey didn't fully address that. For example I'm profoundly deaf in one ear with medical complications and fatigue is a big challenge. Comfort breaks are crucial in all meeting settings but are hard to request. People mumble in meetings in person so online is helpful but that can encourage social isolation which is a natural tendency when deaf. Lastly, people joke about hearing loss and so disclosing deafness in a workplace to ask for captioning etc can be difficult.
6. Thank you for doing this research. Hopefully it will help others with hearing loss.
7. Many academic settings did not consider those with hearing issues/ lip reading when we returned wearing masks.
8. Blended learning online can be quite rushed..if you miss something it is quite difficult to get the teachers to repeat what they have been saying.
9. No. I would love to hear more about how the challenges of face to face meetings for hard of hearing staff or students are being addressed. That is a bigger challenge for me.

Discussion

The survey and this paper were developed with the following objectives:

1. **Understand better the experiences of Deaf and Hard-of-Hearing people in online academic settings**;

2. **Identify different user needs depending on their hearing**

3. **Understand how useful participants find certain technical solutions/software**.

Regarding the experience of Deaf and Hard-of-Hearing participants in online settings, data from Q10 shows participants find it easier to follow in on-screen venues than in in-person venues. The data further indicates that this is due to speech-to-text, or closed captions, services. The use of sign language interpreters in the on-line setting is rarely used. When Deaf and Hard-of-Hearing participants engage in online venues, they do so primarily through written modes of communication (speech-to-text and chat), rather than through spoken modes of communication. This can pose challenges to both organizers and participants as online venues are generally designed primarily around spoken communication. The free text comments left in Q18 indicate that organizers are not always aware of the importance of written communication for Deaf and Hard-of-Hearing participants. As a consequence, participation of Deaf and Hard-of-Hearing respondents in online settings is only slightly higher than in in-person settings.

In the survey design, participants were asked to self-identify in terms of their hearing condition. This rough distinction between Deaf/severe/mild was then used throughout the survey to identify different groups of participants. In relation to online events, these groups can generally be described as

- Participants using hearing aids in online venues. This corresponded to about 40% of respondents. Of this group, a majority described their hearing aid as working well or somewhat well with laptop speakers or headphones.
- Participants using lip reading to follow online venues. This was about 60% of participants. Of this group, only around 25% found it easy to use lip reading in online settings. This is an interesting finding, as generally, the lips of the speaker should be more visible on screen than in person. However, video quality and speech quality (use of lips by speakers) would impinge upon the presumed benefits of up-close on-screen speaker faces.

It is reasonable to assume that different levels of hearing impairment amongst participants impact on the data regarding the use of hearing aid devices to follow on-line meetings.

The relatively high number of participants that are satisfied with the integration between their hearing device and laptop/headphones may be explained in a similar way: Where participants are not satisfied with the integration between hearing aid and computer, they are unlikely to continue using it.

Regarding participation in online events, here the data is also diverse and numerous unknown confounding factors could be at work that we are not taking into account. 41.46% participate to a medium degree and 26.83% in a more active way. Only 19.51% to a lesser degree. Of the Deaf respondents, 30% are located in the "Not applicable" column and another 30% participate actively. It is difficult to obtain a clear trend here, with the numbers leaning towards average degrees of participation; only smaller proportions of respondents indicated greater or lesser participation online, regardless of hearing condition. Here a trend based on the hearing condition specified by respondents could not be determined.

Regarding the data on the preferred type of future modality, 40% of Deaf respondents would prefer face-to-face modality and another 40% hybrid. Regarding the data from the respondents who indicated they were Hard-of-Hearing, 38.46% would prefer the face-to-face modality, 15.38% would prefer entirely online and 30.77% a hybrid modality. **Respondents in the Deaf and Hard-of-Hearing categories tend to prefer face-to-face and hybrid modalities.** While the causality is unclear, participants of all hearing categories expressed their preference for in-person and hybrid modes of communication.

Regarding possible improvements each respondent would like to see, 56.10% believe "Closed captions on by default" would be very useful, while 31.71% think that it could be useful. 70% of Deaf respondents think it would be useful while 20% think it could be useful. Of the Hard-of-Hearing respondents, 57.69% think that "Closed captions on by default" could be very useful and only 30.77% believe that they may be useful. **This indicates that improvements like "Closed captions on by default" are supported by a majority across the range of hearing conditions.**

Regarding the "Option to see the speaker's face even when they share their screen", 58.54% believe that it would be an improvement while 24.39% think that it could be an improvement. Among Deaf respondents, 70% affirm that seeing the speaker's face would help, while 20% affirm that it could be helpful. Among Hard-of-Hearing respondents, 53.85% believe it would be useful, while 23.08% believe that it may be useful. **This indicates that most respondents**

expressed the opinion that the option of seeing the speaker would help them.

Regarding the helpfulness of "Q&A through chat as default", 39.02% of the participants thought it could be helpful while 34.15% that it would definitely be helpful. 40% of Deaf respondents thought it could be helpful while 46.15% of Hard-of-Hearing respondents thought it would be helpful. **The data indicates that the majority of participants felt "Q&A through chat as default" could be helpful.**

46.34% of the survey population stated that "pre-recorded sessions" would be helpful, with 40% of those in this category being Deaf and 53.85% being Hard-of-Hearing participants. Of those who thought it could be helpful, (namely 31.71%) 26.92% were Hard-of-Hearing while 40% reported as Deaf. **The data suggests that participants who primarily take in sessions through audio find pre-recorded sessions more useful than participants who take in sessions primarily through lip reading or closed captions.**

Regarding the improvements in "Sign language interpreting embedded" the numbers are completely reversed: 43.90% believed that would not help, 31.71% could not say, while 19.51% believed that it would help. **In other words, a considerable number of the respondents think that "Sign language interpreting embedded" would not help.** It would be vital here to know the context for this: is this due to the levels of sign-language use among the survey participants or due to the perceived quality of sign language interpreting, or other factors?

In relation to this data, it would also be important to note that the tiny degrees of difference between the modal verbs here: **would / could / may** be useful when speculating on the potential benefits offered by these approaches suggests that better phrasing of this section would have benefitted the survey.

Conclusion

Deaf and Hard-of-Hearing participants encounter considerable difficulty in online meetings and conferences, as the responses show. This suggests that the assumption that current technologies employed increasingly during COVID lockdown do not solve the hurdles faced by people with hearing loss. Adding to the overall barriers to participation in online events, such as need for a quiet space in which to access the online event and suitable hardware, participants expressed that a lack of observable body language, difficulties in lip reading and a lack of accessibility options made it harder to participate.

A general observation expressed by participants was that participants often felt their needs were not adequately considered in online venues. This was seen in meeting and conference elements that solely relied on audio, when subtitles would have been available, or where the quality of that subtitling was subpar.

In conclusion, the survey has revealed that Deaf and Hard-of-Hearing participants still largely prefer face-to-face settings. Moreover, when having to engage in online meeting settings, these participants prefer written communication such as speech-to-text or chat. It became evident from the survey results that in order to increase engagement from and with Deaf and Hard-of-Hearing participants in online settings, organizers will not only have to provide fit-for-purpose closed captioning or sign language interpreting but also ensure written communications modalities that are easy to use and well integrated into the online platform. It is also necessary to take into account participants' level of hearing impairment and provide intuitive settings for audio integration. Finally, it is vitally important that people are aware of the challenges participants with hearing loss face in online environments, and begin to explore in greater detail some of the findings thrown up by this preliminary study.

The short-comings of the study of greatest importance are: lack of inclusion of Deaf / Hard-of-Hearing agents among the designers of the survey and authors of the study; problematic questions from the point of view of the clarity of data they elicit; lack of embeddedness of this study within other studies of its kind or cognate studies. Some of the most important findings of this study have been these shortcomings.