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Telehealth Awareness, Perception, Practice, and Influence of the COVID-19 Pandemic: A Questionnaire to Speech-Language Pathologists and Audiologists.

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ABSTRACT

Objectives: Investigate Speech-Language Pathologists' (SLPs) and Audiologists' telehealth awareness, experience, and perception in terms of applicability, effectiveness, barriers, facilitators, and the influence of the COVID-19 pandemic on telehealth practice.

Methods: A questionnaire was developed and validated based on relevant literature, authors' clinical expertise, and a published survey. Sample size was determined through power analysis and participants were recruited using a snowball-sampling technique.

Results: 95 clinicians completed the survey. 87.4% reported awareness of and 68.4% reported experience with telehealth. SLPs (86.4%) had more experience than Audiologists (38.9%). 78.46% first used telehealth during the COVID-19 pandemic, with no significant difference in telehealth use during versus after the pandemic lockdown. 63.8% reported telehealth being less effective than in-person. However, there were differences in perceived telehealth effectiveness: telehealth was significantly more effective for consultations and counseling, with adults aged 18–40 years; and clients with fluency and speech sound disorders. The highest significant barrier to telehealth delivery was network issues, and available workplace resources was the highest facilitator although this was not significant.

Conclusions: Most clinicians were aware of telehealth, had a positive attitude towards it, and had experience using telehealth. More SLPs than audiologists used telehealth. The COVID-19 pandemic had a positive influence on telehealth service provision with an increase in use that was maintained after in-person services were re-initiated. Perceived effectiveness of telehealth services varied depending on the type of clinical service, client's age, and diagnosis. These factors must be considered while planning telehealth services in Speech-Language Pathology and Audiology.

INTRODUCTION

The World Health Organization defines telehealth as “the delivery of health care services, where patients and providers are separated by distance. Telehealth uses Information and Communication Technologies for the exchange of information for the diagnosis and treatment of diseases and injuries, research, and evaluation, and for the continuing education of health professionals”¹. Telehealth has several advantages, including increased access to care, reduced delay of service delivery, and lower costs; it can also lead to better health outcomes, improved quality of life, and increased client satisfaction²⁻⁷.

In Speech-Language Pathology (SLP) and audiology, telehealth is the use of telecommunication technology to link clinicians to clients, caregivers, or other professionals to provide assessment, intervention, consultation, or supervision services from a distance⁸⁻¹¹. Generally, SLP services are delivered to clients through auditory and/or visual communication without the need for sophisticated equipment, hence most SLP services could be conducted via telehealth while the client is at home or any other location¹². Whereas audiology services generally require the use of equipment, thus most telehealth audiology services require the client to go to a local clinical site that is equipped and has a trained local facilitator to help set up the client for the audiological service¹³.

Telehealth in SLP and audiology has been available from before the global pandemic caused by the novel coronavirus disease 2019 (COVID-19)³⁻⁷, and it has been shown to be an effective mode of service delivery across many speech, language, and hearing disorders (e.g., speech sound disorders, aphasia, stuttering, dysphagia, hearing screening, tinnitus)¹⁴⁻²². Furthermore, the American Speech-Language and Hearing Association deemed telehealth suitable for delivery of SLP and audiology services since 2005⁸. However, literature that surveyed clinicians from different countries [e.g., Australia, United Kingdom (UK), United States of America (USA)] revealed low adoption of telehealth by SLPs and Audiologists²³⁻²⁸.

The global COVID-19 pandemic led to worldwide interruption of SLP and audiology services due to national lockdowns, travel restrictions, social distancing, reduction in certain healthcare services, and cancellation/closure of many outpatient services. Therefore, SLP and audiology telehealth had to be implemented in order not to delay service provision and to ensure continuity of care²⁹⁻³². Several studies have investigated SLP and audiology practices during the COVID-19 pandemic via surveys to professionals. However, each survey investigated different aspects of practice and were specific to either SLPs or Audiologists. For example, a survey to SLPs in Hong Kong and another to SLPs in Malaysia examined use, application, and perception^{30,33}, a survey to SLPs in India investigated application and challenges³¹, a survey to USA pediatric SLPs explored barriers and opinions³⁴, a survey to UK Audiologists looked at practice changes, attitudes, and barriers to telehealth²⁹, a survey to Audiologists in Jordan and some Arab countries investigated

awareness, practice, and barriers³², and a survey to Audiologists in South Africa investigated use and barriers³⁵. This highlights the need for a more comprehensive survey to both SLPs and Audiologists that assesses and compares perceptions and experience across specialties on several aspects of telehealth including awareness, implementation, effectiveness, barriers, facilitators, and the influence of the COVID-19 Pandemic on telehealth practice. It is also important to survey a sufficient sample determined through power analysis, which was done in this study.

The aims of this study were to investigate SLPs' and Audiologists' awareness, experience, and perception towards telehealth services in terms of applicability, effectiveness in relation to the type of clinical service, and the client's age group and diagnosis, barriers, and facilitators, and the influence of the COVID-19 pandemic on telehealth practice. Additionally, experience and perception towards telehealth were compared across the two specialties.

METHODS

i. Participants:

SLPs and Audiologists practicing in Saudi Arabia were recruited using a snowball-sampling technique. Sample size calculation was done based on the number of total licensed SLPs and Audiologists in the country at the time of designing this study (target population of 678 clinicians) with a 95% confidence level and a 10% margin of error. Results revealed that 85 respondents were required for a sufficient sample.

ii. Ethical considerations:

This study was approved by King Fahad Medical City's Institutional Review Board (IRB No. 21-165). Online informed consent was obtained from each participant before voluntarily participating in this study through agreeing to proceed to the survey questions after reading the information sheet.

iii. Questionnaire development:

The perception and experience of telehealth services questionnaire was developed based on a literature review on the barriers and facilitators of telehealth practice^{3,29,36}, a study that was conducted in Hong Kong using a survey in English³⁰, and the clinical expertise of the senior author (RA). Questionnaire face validity was established in a two-steps process. First, the questionnaire was reviewed by three experts in the field with over 10 years clinical experience including the first author (GB), to evaluate whether the survey questions successfully captured the objectives of this research study. The second step involved review by an expert on survey question construction, to ensure that the survey questions do not contain any confusing or double-barreled questions. Some questions were modified throughout the validation process, and the final

questionnaire consisted of six sections with 17 to 32 questions depending on whether the respondents had experience in delivering telehealth services or not (Appendix I).

iv. Data collection and analyses:

Responses were collected via Survey Monkey (www.surveymonkey.com), which was disseminated electronically via e-mail and social media platforms. Survey was open from 18 December 2021 to 29 June 2022 to be able to achieve the required sample size.

Data was exported to Microsoft Excel (version 16.63.1, 2022). Analyses were performed following^{37,38}. Chi-square tests were conducted for contingency tables with two variables. Log-linear analyses were conducted for contingency tables with three or more variables, and Pearson's Chi-square tests to determine relationships. In the log-linear analysis, the saturated model is that fitted with all variables, i.e., the most general model. The saturated model is a baseline for comparison with other models. Using backward elimination, the aim is to find an unsaturated model (i.e., fewer parameters than the saturated one) that holds against the saturated one^{37,38}. For significant Chi-square tests, standardized residuals were used to infer the nature of the relationship³⁷. A standardized residual exceeding 1.96 in absolute value indicated a lack of fit of the null hypothesis, i.e., a significant relationship³⁸. Because the degree of freedom of the data was large, a cut-off of 3.291 was used (i.e., significance level of 0.001³⁹). In cases of sparse tables, with more than 20% of cell counts <5, no statistical analyses were run³⁷. All contingency tables were summarized and analyzed in R (version 4.2.1⁴⁰) via R Markdown⁴¹⁻⁴³ using packages: *crossable*⁴⁴, *flextable*⁴⁵, *gmodels*⁴⁶ and *MASS*⁴⁷.

RESULTS

A total of 115 clinicians responded to the survey, 95 of which completed the questionnaire beyond the background demographics, thus only these 95 were included in the analyses. See Table 1 for background information.

i. Telehealth awareness:

Most clinicians (87.4%) reported awareness of telehealth services in SLP and audiology, with awareness among 91.5% of SLPs and 80.6% of Audiologists. There was no significant relationship between awareness and any demographic information.

ii. Telehealth experience:

68.4% of respondents reported experience with telehealth. There was a significant relationship between specialty and telehealth experience [$\chi^2(1)=23.4$, $p<0.001$], with higher telehealth experience among SLPs (86.4%) than Audiologists (38.9%, Appendix II, Table 1). 14.6% of clinicians reportedly received formal telehealth training via courses or workshops, 15.2% received no training, and the remaining gained knowledge

about telehealth through discussions with colleagues (25%), interprofessional exchange of knowledge (16.5%), literature review (12.8%), and clinical guidelines (15.5%). However, 97.3% of clinicians desired some type of training with the highest desired type of training being telehealth software (23.9%), then service specific telehealth (21.1%), diagnosis specific telehealth (20.2%), technology (17.4%), and age specific telehealth training (14.7%).

iii. Telehealth practice:

The most common reported reason for initiating telehealth services was departmental/organizational choice (32.8%), then client's caregiver choice (24.8%), client's choice (22.4%), and clinician's choice (20%). The most common reported mode of delivery was video-conferencing (42.6%), then audio-conferencing (35.2%), store-and-forward (16.7%), and through a remote facilitator (15.6%). There was a mixture in the reported type of clinical services, age groups, and client groups who received telehealth, with the highest type of service being monitoring (21.8%, Figure 1A), highest served age group was 4-6 years (17.9%, Figure 1B), and highest served client group was fluency disorders (16%, Figure 1C). Most clinicians (53.4%) reported that their clients preferred both in-person and telehealth sessions when they were given a choice, while 39.7% reported that clients preferred in-person sessions, 1.7% reported that clients preferred telehealth, and 5.2% reported no preference.

iv. Influence of COVID-19 pandemic on telehealth practice:

Some respondents (21.54%) reported using telehealth before the COVID-19 pandemic, while the majority (78.46%) reported first using telehealth during the pandemic. Statistical analyses could not be performed on frequency of telehealth use before the pandemic, during lockdown, and after lockdown due to sparse contingency tables (Appendix II, Tables 2, 3). Therefore, results were collapsed to either "used telehealth" (regardless of frequency) or "did not use telehealth" (Table 2). However, there was no significant relationship between the use of telehealth during versus after lockdown regardless of specialty.

v. Perception of telehealth:

a. Telehealth applicability:

Most respondents (81%) felt telehealth can 'sometimes' (55.8%) or 'mostly' (25.3%) be applied, while 6.3% stated 'always', 9.5% stated 'rarely', and 3.2% stated they felt telehealth can 'never' be applied in SLP and audiology service delivery.

b. Telehealth effectiveness:

Most clinicians (63.8%) reported that telehealth, from their own experience, was less effective than in-person sessions, some reported similar effectiveness (29.3%), and a few (6.9%) reported that telehealth was more

effective. Analyses of effectiveness of telehealth against type of service, client's age groups and diagnosis revealed variations in the effectiveness of telehealth (Appendix II, Tables 4–7), as follows:

- A significant relationship between telehealth effectiveness and type of service [$\chi^2(30)=235.7, p<0.001$], driven by: consultation and counseling services were reportedly very effective, while assessments were not effective (Figure 2A).
- A significant relationship between telehealth effectiveness and the client's age group [$\chi^2(35)=141.5, p<0.001$], driven by: telehealth was reportedly very effective for ages 18–40 years, medium effective for ages 4–6 years, low effective for ages 7 months to 3 years, and not effective for ≤ 6 months of age. (Figure 2B).
- Effectiveness of telehealth against client group could not be analyzed due to a sparse contingency table (Figure 2C). Therefore, responses to effective and very effective were merged, this revealed a significant relationship between effectiveness and client's diagnosis [$\chi^2(48)=149.4, p<0.001$], driven by: fluency disorders and speech sound disorders were effective, while Autism or ADHD were low effective..

c. Facilitators and barriers to telehealth delivery:

'Available workplace resources' was the highest ranked 'very strong facilitator' for telehealth (Figure 3A). Analysis produced a final model that retained the interaction between ranking of facilitators and specialty [likelihood Ratio: $\chi^2(45)=36.1, p=0.8$ vs. the saturated model], with a significant relationship [$\chi^2(4)=14.6, p=0.006$] driven by more audiologists than SLPs ranking most facilitators as 'low' (Appendix II, Table 8).

'Internet connection problems' was the highest ranked 'very strong barrier' (Figure 3B). Analysis produced a final model that retained the interactions between ranking and barriers, and between ranking and specialty [likelihood Ratio: $\chi^2(85)=80.2, p=0.6$ vs. the saturated model], with a significant relationship between ranking and barriers [$\chi^2(68)=231.7, p<0.001$], driven by: 'ethical concerns' were either ranked as 'not a barrier' or a 'low barrier', 'lack of workplace space' was 'not a barrier', and 'problems with internet connection' was a 'very strong barrier' (Appendix II, Table 9).

d. Factors to consider when selecting clients for telehealth:

Client's clinical diagnosis and client's access to resources (e.g., hardware, network, support person, etc.) were the highest ranked factors to 'always' consider, and availability of facilitator and equipment was the lowest ranked factor to 'always' consider when selecting clients for telehealth by SLPs and Audiologists. However, there were no significant relationships between ranking and specialty, factor and specialty, or factor and ranking (Appendix II, Table 10).

DISCUSSION

This study found: (1) most SLPs and Audiologists were aware of telehealth and had a positive attitude towards it; (2) the COVID-19 pandemic had a positive influence on telehealth service provision with an increase in the use of this service; (3) majority of SLPs had experience using telehealth compared to only a third of Audiologists; (4) effectiveness of telehealth services varies depending on the type of clinical service, client's age and diagnosis, where it is reportedly more effective for consultations and counseling, with adults aged 18–40 years; and clients with fluency or speech sound disorders; (5) the highest barrier to telehealth delivery was network issues, and available workplace resources was the highest facilitator.

i. Telehealth awareness and attitude:

Awareness of telehealth by SLPs and Audiologist in Saudi Arabia was higher than previously reported by SLPs in other countries, including Hong Kong (81.8%)³⁰ and Italy (25%)⁴⁸, and by Audiologists in Jordan and some Arab countries (61.6%)³². Most respondents had a positive attitude towards telehealth and felt that it can be applied in SLP and audiology service delivery, which is higher than previously reported by SLPs in Hong Kong (56.8%)³⁰. These differences are probably related to the timing of the survey, as these surveys were conducted in 2020, i.e., earlier in the pandemic when telehealth services were being initiated in response to COVID-19 restrictions. While respondents in this study were probably more experienced with telehealth compared to the earlier stages of the COVID-19 pandemic. However, over two-thirds of respondents felt that telehealth is less effective than in-person sessions, consistent with previous studies^{30,48–51}.

ii. Telehealth experience:

The majority of SLPs had experience using telehealth compared to only a third of the Audiologists. And they delivered telehealth primarily through video and/or audio-conferencing, similar to previous studies^{34,35,52–54}. Reported experience with telehealth by SLPs is consistent to that reported in Canada⁵⁵ (98%), and higher than in Hong Kong³⁰ (35%) and an earlier survey in Saudi Arabia (67%)⁵². It is possible that experience with telehealth was higher in this study because the other survey in Saudi Arabia⁵² was conducted over a year before this survey. While reported experience with telehealth by Audiologists was within the range reported by Audiologists in other Arab countries (25.4% in Egypt and Saudi Arabia⁵⁶, 48.2% in Jordan and other Arab Countries³²) but was lower than reported by Audiologists in Australia (62%)⁵⁷ and by an international survey to Audiologists (61.5%, most respondents were from Australian, USA, and South Africa)⁵⁸. Furthermore, experience with telehealth by Audiologists was significantly lower than experience by SLPs, a direct comparison of telehealth experience between SLPs and Audiologists that was not previously reported in the literature. This is not unexpected given that most audiology telehealth services require equipment to be set up at a local clinical site with a trained local facilitator to help with the procedure. While most SLP services

can be delivered using materials (e.g., pictures) that can be shared via video-conferencing or store-and-forward while the client is at home.

Although many clinicians reported telehealth experience, only a few received formal training, whereas the majority reported desiring some type of formal training. These findings are consistent with other studies^{33,57,59}. This highlights the need for and importance of integrating telehealth within formal education for SLPs and Audiologists.

iii. Influence of the COVID-19 pandemic on telehealth practice:

Most clinicians reported first using telehealth during the COVID-19 pandemic. Initiating telehealth SLP and audiology services during the pandemic by most clinicians was a trend across many countries (e.g., Canada, Iceland, UK, USA)^{29,51,54,55,60}. There was also no significant relationship between the use of telehealth during the national lock down or after the lockdown was lifted, indicating that telehealth services continued even after in-person services were reinitiated. Similar findings were reported by SLPs in Singapore³³. In contrast, telehealth SLP services in Iceland⁵⁴ reportedly dropped after the lockdown but were still higher than before the COVID-19 pandemic. While Audiologists in the UK and around the world stated they will continue to use telehealth after the pandemic^{29,58}. The fact that telehealth services remained after reinitiating in-person services indicates that the COVID-19 pandemic had a positive influence on telehealth service delivery.

iv. Telehealth effectiveness:

This study found that perceived effectiveness of telehealth varies depending on the type of clinical service and client's age and diagnosis. The most effective types of service were consultations and counseling, and the least effective was assessment. This may be because consultations and counseling are easier to conduct via telehealth as they primarily require a conversation between the clinician and the client and/or their family with no need for assessment or therapy materials, supplies, or equipment. Clients' age where telehealth was reportedly most effective was 18–40 years, and it was reportedly minimally effective for those between the ages 0–3 years. The client group where telehealth was reportedly least effective was Autism or ADHD, and those where telehealth was reportedly most effective were fluency and speech sound disorders. Telehealth may be more difficult with younger children and with clients with Autism or ADH as it may be more challenging to maintain control of the session when these clients are not in the same room. Difficulties controlling the session or child's behaviors were also reported as a challenge by SLPs in India and Hong Kong^{31,50}. This is the first study to show results related to clinician's reports on effectiveness of telehealth in relation to the type of service, client's age group, and diagnosis. These results are interesting, and they could guide healthcare planning and establishment of clinical services in terms of which client groups to target for telehealth versus those to target for in-person services. This could also guide future research on clinical trials looking into

effectiveness of telehealth with the different types of services, client's age groups and diagnosis then comparing these results with clinicians' attitudes towards effectiveness across these factors.

v. Facilitators and barriers to telehealth delivery:

The strongest barrier to telehealth service delivery was problems with internet connection, this is consistent with other literature^{31,34,35,52,53,61}. This highlights the importance of considering this when offering telehealth service to clients, as some clients especially those living in rural areas might not have internet access. Although not significant, available workplace resources was the strongest facilitator of telehealth. This would suggest differences in the implantation of telehealth across different settings based on available resources, a relationship to explore in future research.

CONCLUSION

SLPs and Audiologist in Saudi Arabia are aware of and have a positive attitude towards telehealth services, however, more SLPs than Audiologists use telehealth. The COVID-19 pandemic had a positive influence on telehealth SLP and audiology services, with an increase in telehealth service provision that was maintained after in-person services were re-initiated. Effectiveness of telehealth varies depending on the type of clinical service and client's age and diagnosis. Consultations and counseling are reportedly the most effective services that can be delivered through telehealth, and telehealth is reportedly most effective for adults aged 18–40 years and for clients with fluency or speech sound disorders. And internet connectivity is the largest barrier to telehealth service delivery. These factors must be considered when planning telehealth services clinically and in research. Therefore, when an institute in planning to establish or expand to telehealth services in SLP or audiology, they should be aware that it is more likely for SLPs to provide telehealth services, the target population for these services should be adults, and that the primary type of services they should target are consultations and counseling. It would also be important to ensure the network infrastructure can handle this service and that the clients being targeted have access to the internet. Future studies should be conducted to investigate clients' and caregivers' perception and attitude towards SLP and audiology telehealth services. It is important to consider effectiveness, facilitators, and barriers of telehealth from the clinician's perceptive as well as clients' and caregivers' perceptive. This is critical especially since telehealth services have become a more common mode of service delivery since the COVID-19 pandemic. Understanding factors that could influence the effectiveness and implementation of telehealth would significantly enhance service delivery.

Authors' contribution:

GB: methodology, data collection, data analyses, writing: original manuscript, writing: reviewing and editing.

EP: data analyses, writing: reviewing and editing.

RA: conceptualization, methodology, data collection, writing: reviewing and editing, funding acquisition.

Authors' disclosure (conflict of interest):

None to declare.

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Tables:**Table 1.** Respondent Demographic Information (N = 95)

	Response Choices	Responses	
		Percentage	Count
Age (Years)	23 – 28	47.37	45
	29 – 34	18.95	18
	35 – 40	18.95	18
	41 – 46	9.47	9
	47 – 52	2.11	2
	53 – 58	3.16	3
	59 – 64	0.00	0
	> 65	0.00	0
Gender	Female	63.16	60
	Male	36.84	35
Highest Qualification	Bachelors	61.05	58
	Masters	30.53	29
	Clinical Doctorate	4.21	4
	PhD	4.21	4
Current Position	Specialist (SLP, Audiologist)	69.47	66
	Senior Specialist	21.05	20
	Consultant	6.32	6
	Academic	3.16	3
Specialty	Speech-Language Pathology	62.11	59
	Audiology	37.89	36
Years of work experience	< 1 year	12.63	12
	1 - 2 years	10.53	10
	3 - 5 years	34.74	33
	6 – 10 years	14.74	14
	11 – 15 years	10.53	10
	16 – 20 years	12.63	12
	> 20 years	4.21	4
Work Sector	Publicly Funded Healthcare System	48.42	46
	Nonprofit Organization	7.37	7
	Military Hospital	5.26	5
	University Clinic/Hospital	10.53	10
	Private Healthcare	25.26	24
	Educational Institution	3.16	3

Table 2. Responses to question “how often did you use telehealth per week?” presented per specialty for clinicians who stated that they started using telehealth during the pandemic, after collapsing responses.

	Speech-Language Pathologists		Audiologists	
	Used telehealth	Did not use telehealth	Used telehealth	Did not use telehealth
During national lockdown	46 (92.0%)	4 (8.0%)	46 (92.0%)	4 (8.0%)
After national lockdown	38 (76.0%)	12 (24.0%)	38 (76.0%)	12 (24.0%)

Figure Legends:

Figure 1. Type of clinical services (A), client's age groups (B), and client's diagnoses (C) who received SLP or Audiology telehealth services (by percentage).

Abbreviations: AAC: Augmentative and Alternative Communication, ADHAD: Attention Deficit Hyperactivity Disorder, CCD: Cognitive Communication Disorders, DLD: Developmental language disorders.

Figure 2. Perceived effectiveness of telehealth as reported by clinicians' own experience according to the (A) type of clinical services, (B) client's age groups, and (C) client's diagnosis.

Abbreviations: AAC: Augmentative and Alternative Communication, ADHAD: Attention Deficit Hyperactivity Disorder, CCD: Cognitive Communication Disorders, DLD: Developmental language disorders.

Figure 3. Ranking of (A) facilitators and (B) barriers to telehealth service delivery by SLPs and Audiologists.

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Figure 1.

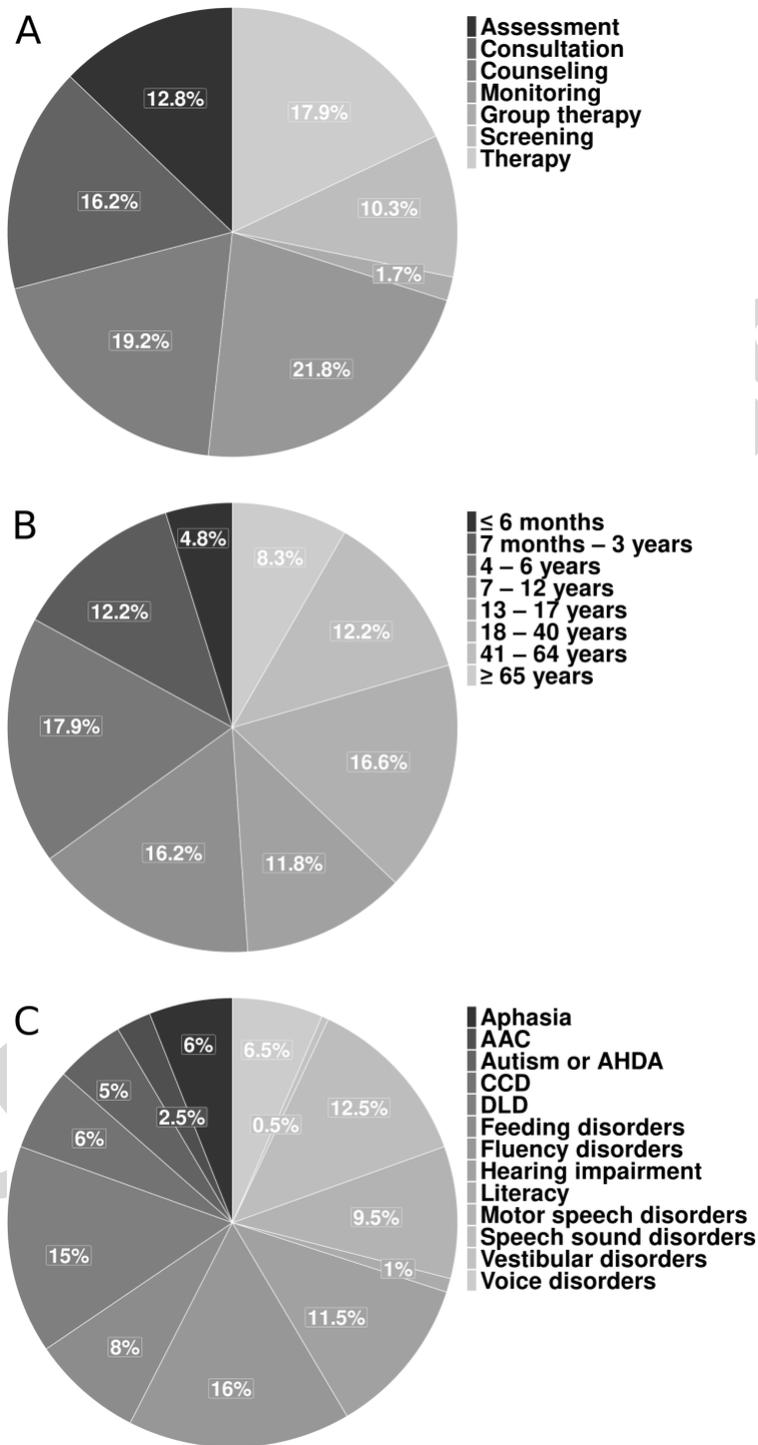
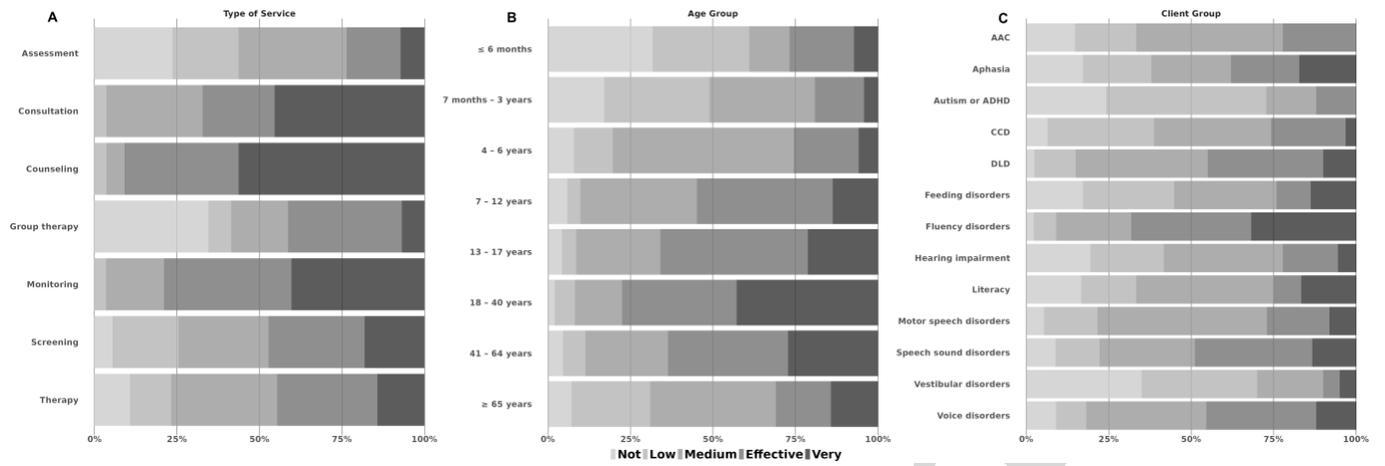
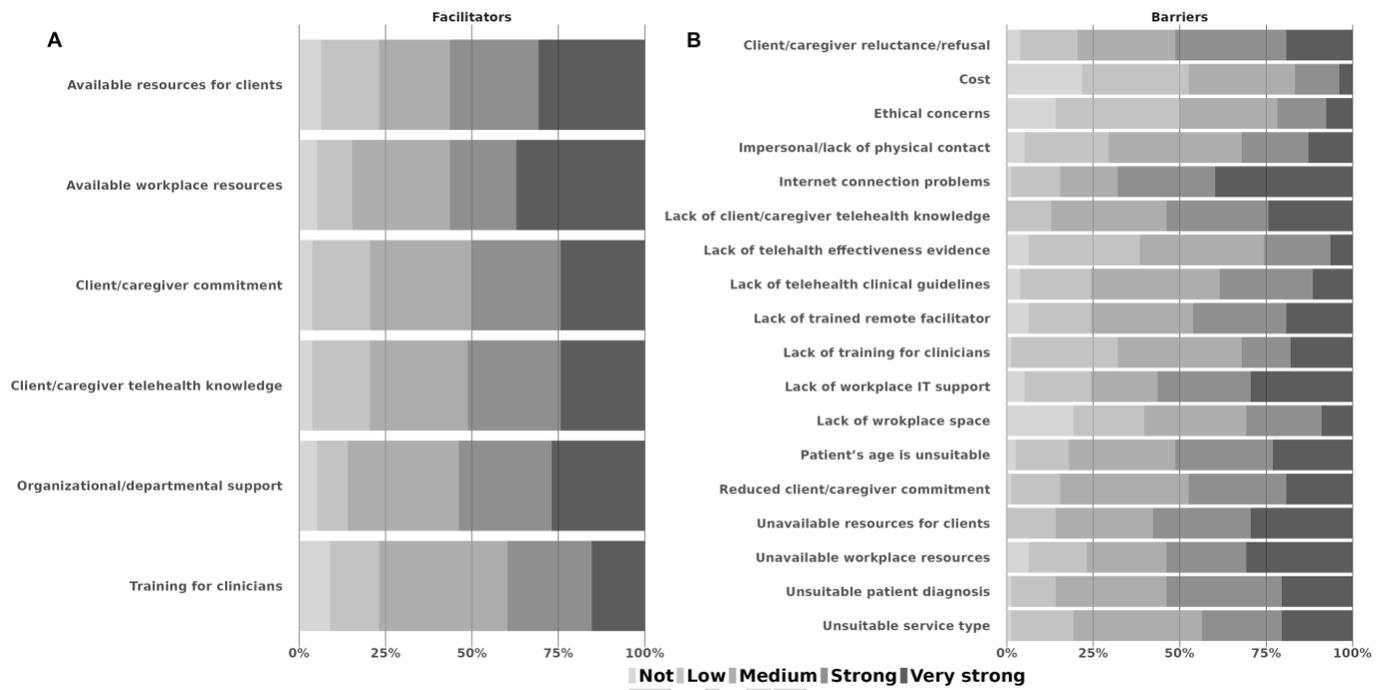


Figure 2.



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Figure 3.



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