REVIEW ARTICLE

Face-to-face and Telespeech Therapy Services for Children during the COVID-19 Pandemic: A Scoping Review

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Abstract

Objectives

There has been increased interest in using telepractice in clinical services during COVID-19. Using telepractice is little known in speech and language therapy. However, the parents and speech therapists were satisfied with this method. Therefore, this scoping review aims to compare tele speech therapy and face-to-face speech therapy during the COVID-19 pandemic and determine the efficacy of available telepractices in speech therapy.

Materials & Methods

This scoping review was according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) guideline. The authors systematically searched Web of Science, PubMed, and Scopus databases with specific eligibility criteria. The eligibility criteria were studies published from 1 January 2020 to 10 May 2023 from a peer-reviewed journal and written in English. In addition, the articles were about speech therapy in children during COVID-19.

Results

Fifteen articles were included in this scoping review. Results showed that approximately all speech therapists used tele practice during the pandemic. Parents and students are satisfied with this method but have problems with it. On the other hand, some parents and SLPs preferred tele practice accompanied by face-to-face intervention. Furthermore, few studies determined the efficacy of tele practice with clear structural methods in specific populations.

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Conclusion

Although tele speech therapy is acceptable for providing speech and language therapy services to children with swallowing and communication disorder, speech-language therapists should increase their information and technology to achieve successful results. Moreover, parents must play an essential role in telepractice services to facilitate effective communication between clinicians and families.

Keywords: Telehealth; Telerehabilitation; speech therapy; Communication disorder; Swallowing disorder; Children; COVID-19.
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Introduction

Speech-language pathologists (SLPs) are professionals who engage in professional practice in communication and swallowing for various populations. SLPs contribute to the prevention, evaluation, intervention, and program design of a range of communication disorders in childhood (1). SLPs typically rely on in-person interactions with clients to deliver their services. However, utilizing an online service delivery model is an appropriate model for audiologists and SLPs (2), and this model could be the primary mode of service delivery or supplement in-person services (known as hybrid service delivery). Services delivered by audiologists and speech-language pathologists are included in telerehabilitation using tools such as telephone and video conferencing, mobile devices, and e-mails (3). Gabel et al. compared the effectiveness of tele practice services to in-person services for seventy-one school-age children with speech sound disorders. The results determined that children had similar improvement in their speech sound production as measured by the National Outcomes Measurement System (NOMS) (4). Similarly, Coufal et al. reported no significant differences in students' ASHA NOMS scores between in-person and tele practice services for speech sound production (5).

The COVID-19 pandemic has resulted in global changes in healthcare systems and professional service delivery. Many professional services, such as speech therapy, were pressed to adopt tele practice in response to the global coronavirus pandemic (9-10). SLPs usually require face-to-face communication with their clients to provide adequate assessment and treatment services. However, due to quarantine and social distancing, speech therapy has been seriously interrupted. Very few SLPs had experience with tele practice before the pandemic (6, 7). However, challenges in implementing tele practice, such as the lack of guidelines for maintaining and delivering the services, have been reported (8). Many individuals have found telehealth to be accessible and feasible. In addition, some researchers reported that barriers to accessing telehealth, such as bandwidth, WiFi access, access to a device for the telehealth session, caregiver support, and socioeconomic status, could disturb providing services. Experience hearing or seeing difficulties on video calls is another challenge for children with speech and language problems(9, 10).

In order to collect information about how to provide speech therapy services during the COVID-19 pandemic, the present scoping review was performed to describe service provision to treat speech-language disorders of children during the COVID-19 pandemic. Moreover, this study tried to explain the access to speech therapy services during the COVID-19 pandemic.

Materials & Methods

The present study is a scoping review. Scoping reviews are appropriate for answering broader questions, so they should have different essential reporting items from systematic reviews (11). The main review questions were "How are speech therapy services for children being provided during the COVID-19 pandemic?", "What are the barriers and facilitators in tele practice speech therapy?" and "What is the efficacy of tele practice speech therapy during COVID-19?" This study reviewed articles according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) guidelines (11). This scoping review included experimental and observational studies published from 1 January 2020 to 10 May 2023 that were peer-reviewed or preprinted. The authors systematically searched the three databases, Web of Science, PubMed, and Scopus, using MeSH/Index terms and included those terms in a Title/Abstract search to receive the most published articles. The search terms were "COVID-19, SARS-CoV-2, Child, Children, Adolescent, Students, Teen*, Youth, Kid, Parents, Parent, Communication, Rehabilitation, Speech, Language, Swallowing, Hearing, Therap*, Service, Intervention". The PubMed syntax is shown in Appendix A. The authors selected the appropriate articles according to the inclusion criteria. Articles that were published in English were included. This study's search was restricted to studies that each domain of speech therapy services delivered to children and adolescents 0–18 years old. The researchers selected the articles that include the self-report, speech therapist, or caregiver report. This study excluded case reports, case studies, opinions, editorials, commentaries, letters, conference abstracts, reviews, and qualitative studies. Moreover, the current study excluded articles about speech therapy services for adults. Additionally, articles that were not published in English or fell outside the research timeline were excluded. After searching the databases, a total of 3071 articles were collected. After removing the duplicated articles, two independent reviewers (M.T, H.M) screened the titles and abstracts of 2790 remaining articles in two steps. In the first step, they screened the title and abstracts of articles. In the second step, if needed, the two reviewers (H.M, Z.N) independently screened the full study texts to investigate whether they met the eligibility criteria. Finally, in cases of discordance, a third researcher (F.S.) was consulted to reach a final decision.

Two independent reviewers (F.H and H.M) extracted the data from all included studies. The extracted data for each article were first author, country, study design, sample size, measurement tools, and results.

Results

Three thousand seventy-one papers were identified, and 2790 abstracts were retrieved after removing duplicates. By reviewing the titles and abstracts of these articles, 140 articles were selected for reviewing the full text. Finally, 15 papers were included for analysis (12-25), outlined in the PRISMA Flowchart, as shown in Figure 1.

Eight hundred forty-eight articles were published on Web of Science, 571 in PubMed, and 1652 in Scopus. Among the included studies, two articles were published in 2020, six in 2021, four in 2022, and three in 2023. Ten articles focused on the efficacy of special assessments or interventions. Five articles were about the parent/ caregiver or SLP's view of the effectiveness of telerehabilitation and its facilitators and barriers.

How was the access to speech therapy services during the COVID-19 pandemic?"

This scoping review demonstrated that the SLPs used online tele practice and face-to-face therapy during COVID-19. The SLPs reported no difference in the caseloads compared to face-to-face therapy (26, 27).

According to the opinion of parents and SLPs, most of the SLPs used tele practice speech therapy for children during COVID-19 (14, 16, 28). In addition, the SLPs and parents believe that telepractice has cost-efficient up to 90%, and they preferred to continue tele practice therapy after the COVID-19 pandemic (68%) (29). However, they believed face-to-face therapy is required after six months (16). More details are shown in Table 1.

What are the barriers and facilitators in telepractice speech therapy?

The most frequent barriers to providing teletherapy are children's difficulty with WiFi access at home from 134.8% (30) to 70.4% (27), poor attendance for teletherapy sessions (68.8%) (27), low levels of children's engagement (64.9%)(27), and unclear voice (15.7%)(30). Many studies believe that lack of support or resource and insufficient evidence for tele practice are important reasons SLPs did not use tele practice speech therapy appropriately (28, 29). In one study, all clinicians believed that online treatment is difficult, especially for children with behavioral issues, autism spectrum disorders (ASD), hearing loss (HL), attention deficit and hyperactivity disorder (ADHD) (31).

Most facilitators mentioned in Santayanan's study, such as access to remote or underserved populations (23.32 %), have less stress related to a therapy program (20.27 %) and observed the treatment at home by parents and children (17.23 %)(29). Other studies determined other reasons such as best use of time (25.8%), use of audiovisual technique (16.9%), no need to travel (13.5%), rapid progress (11.3%), Willingness of child to telehealth (77.0%), comfort level with videoconferencing (61.0%), and internet access (58.1%) (30). (More reasons are in Table 1).

What is the efficacy of telepractice speech therapy during COVID-19?

This scoping review revealed that few experimental studies were about tele speech therapy during the COVID-19 pandemic (15, 17-25, 32). One of them is studying about taking language samples at home. The researchers found that there is not any significant difference between in-person and video chat assessments (17). Furthermore, two studies about promoting language skills via tele practice showed that teleinterventions could potentially improve some language skills in children(18). On the other hand, studies that used the telepractice intervention for children with cleft palate (22), ASD (23), and stuttering(21) showed the significant main effect of this telerehabilitation. However, children with cochlear implants (CI) preferred conventional rehabilitation(24). More details are shown in Table 2.

Moreover, in one study, 55% of participants did not report any significant differences between in-person and telepractice interventions (28).

One study used artificial intelligence to evaluate the effects of speech therapy effects on autistic children's behavior. Results showed that the in-person treatment had 69.6% satisfaction, but the telehealth intervention had the minimum effect (25).

Studies reported that approximately 100% of SLPs use online services primarily for language intervention (33). Furthermore, the pediatric intervention is the most difficult telepractice intervention (16), and the language difficulty had minimum telepractice speech therapy (34).

Table1: **Access** to speech therapy services during the COVID-19 pandemic; their facilitators and barriers

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
Barriers and facilitators: Clinicians' opinions and experiences of telehealth before and after their use of a telehealth platform for child language assessment	Sutherland (2021)	Australia	Mixed-methods questionnaires	38 SLPs	questionnaires	-Change in confidence level of administering CELF-5[1] (The Clinical Evaluation of Language Fundamental) through telehealth ($Z = -3.776$, $p = 0.000$) -Comparison of the pre-trial questionnaire between SLPs who completed or did not complete CELF-5 assessment during the Trial: Variable (Level of comfort in conducting telepractice sessions) - Very uncomfortable: Yes (n = 27) =0 (0%) No (n = 11) = 1 (12.5%) -Somewhat uncomfortable: Yes (n = 27) =2 (8.3%) No (n = 11) = 0 (0%) - Neither comfortable nor uncomfortable: Yes (n = 27) =6 (25%) No (n = 11) = 2 (25%) - Somewhat comfortable: Yes (n = 27) =13 (54.2%) No (n = 11) = 4 (50%) - Very comfortable: Yes (n = 27) =3 (12.5%) No (n = 11) = 1 (12.5%)

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Barriers and facilitators: Clinicians' opinions and experiences of telehealth before and after their use of a telehealth platform for child language assessment	Sutherland (2021)	Australia	Mixed-methods questionnaires	38 SLPs	questionnaires	Variable (Level of confidence conducting CELF-5 via telehealth) - Not at all: Yes (n = 27) =5 (18.5%) No (n = 11) = 2 (18.2%) - Not confident: Yes (n = 27) =5 (18.5%) No (n = 11) = 6 (54.5%) - Neutral: Yes (n = 27) =8 (29.6%) No (n = 11) = 2 (18.2%) - Somewhat confident: Yes (n = 27) =8 (29.6%) No (n = 11) = 1 (9.1%) - Very confident: Yes (n = 27) =1 (3.7%) No (n = 11) = 0 (0%)

Table1: **Access** to speech therapy services during the COVID-19 pandemic; their facilitators and barriers

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
Psychosocial factors, but not professional practice skills, linked to self-perceived effectiveness of telepractice in school-based speech and language therapists during COVID-19 pandemic	Lam (2022)	Hong Kong	Online survey	72 school-based SLPs	Survey	Concerns of providing telepractice: - Student privacy= 85% -Lack of local professional standards= 59% -Student candidacy = 42% -Evidence-based practice = 39% Treatment areas: - Primarily for language intervention =100% - Speech =76% -Voice =67% - Fluency treatment =50% - Language cases= 3.80) 0.66) Student candidacy: -Student candidacy= 2.40(1.00) (Not important factor) -Communication and behavioral dysfunctions= 4.07(0.90) (Important factor) -Comorbidity= 3.00, (0.90) and progress and prognosis =2.58 (0.95) (Moderate importance)

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Psychosocial factors, but not professional practice skills, linked to self-perceived effectiveness of telepractice in school-based speech and language therapists during COVID-19 pandemic	Lam (2022)	Hong Kong	Online survey	72 school-based SLPs	Survey	Difficulty of telepractice (Compared with onsite practice): - Therapy preparation= 4.73 (0.97) -Controlling students' behaviours= 4.31 (0.71) -Students' inadequate concentration= 4.18 (0.72) -Communicating naturally= 3.76(0.72) -Monitoring progress= 2.99 (0.89) -Scaffolding = 2.61(0.91) -Teaching=2.40 (0.94) - Difficulty in managing the behaviours of students= 4.31(0.71) -Unnatural communication = 3.76 (0.72) -Lacked adequate concentration of students during telepractice= 4.18 (0.72) Attitude of SLPs: - Unfavourable attitudes towards telepractice= 2.13 (0.78) -Telepractice difficult= 4.29 (0.67) -Telepractice to be slightly less effective= 2.92 (1.00) - Generally preferred on-site practice to telepractice= 4.50 (0.66) -Most would not consider using telepractice in the future=1.89 (1.08)

Table1: **Access** to speech therapy services during the COVID-19 pandemic; their facilitators and barriers

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
No other choice: Speech-Language Pathologists' attitudes toward using telepractice to administer the Lidcombe Program during a pandemic	Santayana (2021)	Canada and the United States of America	Online survey	106 SLPs	Survey	Percentage of time telepractice was used by SLPs before and during the COVID: -Prior = 80 %of SLPs 0–10 % of the time -During = more than 50% of SLP more than 50% of time - Continue to use both telepractice and in-clinic treatment in the future= 68% -Preference to return to in-clinic= 5% Delivery model in the future: - Face to face= < 10% -Telepractice= < 5% -Mix of them= 60-70% -Depends on what suits the individual= 20-30% -Undecided= 1% Comments challenges: -Issues concerned the technology itself = 27% -Access to resources and learning to use the new platforms= 19% Issues related to the clinical relationship. -Challenges of establishing and maintaining the clinical relationship= 33% -Issues related to the clinical process Comments – positives: -Access to remote or underserved populations = 23.32 % -Less stress related to scheduling= 20.27 % -Observe treatment in home= 17.23 %

Table1: **Access** to speech therapy services during the COVID-19 pandemic; their facilitators and barriers

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
An exploratory study of speech-language pathologists' clinical practice in the literacy domain: Comparing onsite practices with telepractice services during COVID-19	Furlong (2022)	Australia and New Zealand	Online cross-sectional survey	44 SLPs	Online survey	Caseload and service delivery prior to COVID-19: -Average= 6 and 10 (n=6) and 11–15 (n=6) students per Week -Larger caseloads= 36 and 40, or more than 50 students per week Caseload and service delivery during COVID-19: -Seeing fewer students= n=30 -For individual literacy sessions=most participants no change to session frequency (n=31) or duration (n=34) -Reasons of more frequent sessions= reduced travel for families + need for shorter and more frequent sessions due to students' attention spans + to address parental concerns around the level of support their students were receiving through school during remote learning + student preference -Change in session duration for small groups= yes

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An exploratory study of speech-language pathologists' clinical practice in the literacy domain: Comparing onsite practices with telepractice services during COVID-19	Furlong (2022)	Australia and New Zealand	Online cross-sectional survey	44 SLPs	Online survey	Literacy assessment for onsite delivery and telepractice delivery: More than half of the participants (n=25) = no change. Changes to intervention practices for telepractice Delivery: -Nearly half (n=20) = a little change= several changes (n=10) + significant changes (n=6) -Changes to intervention= resources or activities used in intervention, for example, finding web-based materials and converting documents for online use (e.g. scanning, use of document cameras, use of interactive PowerPoint presentations) -All participants= less use of games to varying degrees -Many participants= less handwriting and more typing for spelling and writing Telepractice literacy services: -Prior to the COVID-19= the majority (n=33) = none of literacy caseload= were seen via telepractice

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An exploratory study of speech-language pathologists' clinical practice in the literacy domain: Comparing onsite practices with telepractice services during COVID-19	Furlong (2022)	Australia and New Zealand	Online cross-sectional survey	44 SLPs	Online survey	-During the COVID-19: more than half of literacy caseload=(n=29) =seeing more than 75% of their literacy caseload= via telepractice -Reasons caseload seen via telepractice changed during COVID-19: For most= due to government-enforced restrictions + change to schools closing and being unable provide onsite services + need for continued access to services -The main reason for continuing with telepractice= Student preference -Next most common reason: the flexibility and convenience of telepractice + reduced travel time for families + increase in referrals from rural -Reasons for not continuing preference for providing onsite services+ scheduling difficulties during school hours + limited access to internet and devices for some students. -Most participants (n=37) = differences between onsite and telepractice,

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Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
An exploratory study of speech-language pathologists' clinical practice in the literacy domain: Comparing onsite practices with telepractice services during COVID-19	Furlong (2022)	Australia and New Zealand	Online cross-sectional survey	44 SLPs	Online survey	-Most commonly differences: more difficulty maintaining students' attention and engagement in telepractice sessions (n=11) + difficulties detecting nonverbal cues and seeing the student working in telepractice sessions + less able to provide timely and accurate feedback (n=8) + technological challenges in telepractice sessions (n=7), more reliance on parents to support students in telepractice sessions (n=3) + parents needed to be more involved (n=3) -More than half (n=24) = no difference in intervention outcomes Barriers with implementing telepractice: most= technological challenges+ families not wanting to Engage+ lack of appropriate resources -The most cited benefits relating to telepractice: Increased parent and/or teacher involvement and engagement in sessions + increased accessibility to services

Table1: **Access** to speech therapy services during the COVID-19 pandemic; their facilitators and barriers

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
Parent's Perspective on Teletherapy of Pediatric Population with Speech and Language Disorder During Covid-19 Lockdown in India	Sikka (2023)	India	Surveys	100 parents of children with speech and language delays, Misarticulation, Stuttering, Voice disorder	A questionnaire with 12 close-ended questions	-95% of parents: the therapy call during the pandemic was a great motivation for them to continue the sessions. -92%: teletherapy helped them to improve their child's language skills and positive regarding the teletherapy sessions. -97%: they could follow the clinicians very well, -96%: sufficiently understand the language strategies used, -86%: video calls should be the standard component, -96%: teletherapy was a handy alternative to face-to-face therapy. Comparison Between Teletherapy and Face-to-Face Intervention -90%: teletherapy were more cost-efficient. -88%: face-to-face consultation is required after six months

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Results	-In person, Video chat: MLU[3] (mean length of utterance) = (Mean (SD))1.69 (0.58), 1.75 (0.68), P value: 0.85 NDW[4] (Number of different words) = (Mean (SD)) 37.13 (11.90), 37.59 (12.63), P value:0 .90 TTR[5] (type–token ratio) = (Mean (SD)) 0.48 (0.09), 0.46 (0.09), P value: 0.30 -Within-subjects for the mixed visit structure group: -In person, Video chat MLU= (Mean (SD)) 1.90 (0.62), 1.90 (0.63), P value: 0.65 NDW= (Mean (SD)) 40.23 (10.42) ,41.65 (13.44) P value: 0.51 TTR= (Mean (SD)) 0.48 (0.07), 0.47 (0.11), P value: 0.81
Measurement tools	Assessment: -In-person language samples= two Panasonic PTZ HD video cameras + a Shure omnidirectional table microphone + recorded to a single file using an Extron switcher -Video chat samples: a smartphone, tablet, or computer Language Sample Transcription: using Systematic Analysis of Language Transcripts (SALT[2]) software
Sample size, male (N or %) & Diagnosis (N or %)	All: 62 Normal In-person (n =16) Video chat (n = 46)
Study design	A mixed quasi-experimental and longitudinal design
Country	United States
First Author, (year)	Manning (2020)
Title	Taking Language Samples Home: Feasibility, Reliability, and Validity of Child Language Samples Conducted Remotely With Video Chat Versus In-Person

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	Promoting Language Skills in Children with Neuromotor and intellectual Disorders: Telepractice at the Time of SARS-CoV-2
First Author, (year)	Micheletti (2021)
Country	Italy
Study design	Longitudinal study
Sample size, male (N or %) & Diagnosis (N or %)	All: 9 Male:3 Diagnosis: Unilateral cerebral palsy (CP)=4 Bilateral CP=2 Ataxic syndrome =2 Severe motor coordination Disorder=1
Measurement tools	Assessment all= -nonverbal intelligence: means of the Leiter International Performance Scale–Revised -Adaptive functions: Vineland Adaptive Behavior Scales -Gross Motor Function Scale - Peabody Motor Developmental Scale Assessment NDs: neurological examination, medical history, Gross Motor Function Scale, Peabody Motor Developmental Scale -Assessment after intervention= Assessment of Phonological Production of Children test + Italian adaptation of the MacArthur–Bates Communicative Development Inventory Italian-specific and Italian-normed test derived from the Test for the Reception of Grammar, sentence repetition test.
Results	-Speech component (No. of stable phonemes): Prebaseline[6] (outcome measures 3 months before the intervention) = M(SD)= 7.2 (4.1) Baseline[7] (outcome measures 1 week before the Intervention) = 7.6 (4.4) T1[8] (outcome measures immediately after the intervention) = 10 (4.4) T2[9] (outcome measures at a 3-month follow-up) = 10.9 (4.6) -Lexical component (Word comprehension at PVB[10] (Primo Vocabolario del Bambino, A language inventory) (no. of words): Prebaseline = 296.9 (111.7) Baseline= 315.9 (109.3) T1 = 412.3 (48.9) T2 = 478.7 (55) -Word reproduction at PVB (no. of words): Prebaseline= 191.6 (163.2) Baseline= 200.2 (165.2) T1 = 275.9 (180.4) T2= 304.1 (192.7) -Syntactic component Sentence comprehension: Prebaseline= 1.3 (0.7) Baseline = 1.6 (0.7) T1= 2.9 (0.8) T2= 2.9 (1.2)

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
						-Sentences repetition task (no. of repeated sentences): Prebaseline= 0.7 (1.1) Baseline= 1.4 (2.4) T1= 6.1 (6.9) T2= 7.9 (7.1) -The number of stable phonemes at prebaseline and baseline= (ratio: 1.05; 95% CI [0.68, 1.61]; p = .99) -At baseline and T1 = (ratio: 1.32;95% CI [0.89, 1.97]; p = .22) -At T1 and T2 = (ratio: 1.09;95% CI [0.76, 1.56]; p = .89) 1.06; 95% CI [0.74,1.50]; p = .963) -After the 3-month intervention: WC[11] (word comprehension): ratio= 1.33; 95% CI [1.03, 1.71];p = .025 WP[12] (word production): ratio= 1.39; 95% CI [1.00, 1.92]; p = .046) -At the 3-month follow-up: WC: ratio= 1.15; 95%CI [0.92, 1.45]; p = .293 WP: ratio= 1.09; 95% CI [0.81–1.45]; p = .825) -Syntactic component between prebaseline and baseline evaluations: sentence comprehension: ratio= 1.17; 95% CI [0.73, 1.90]; p = .76 sentence repetition: ratio= 2.17; 95% CI [0.63, 7.41]; p = .31 -After the telepractice program: sentence comprehension: ratio= 1.80; 95% CI [1.24, 2.35]; p < .01 sentence repetition: ratio= 4.23; 95% CI [1.96, 9.12]; p < .01) -At the 3-month follow-up: sentence comprehension, which remained stable: (ratio= 1.00; 95% CI [0.75, 1.35]; p = 1) sentence repetition: (ratio= 1.29; 95% CI [0.83, 2.02]; p = .31)

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	Effectiveness of cloud-based rehabilitation in children with developmental language disorder during the COVID-19 pandemic A prospective cohort study
First Author, (year)	Yi (2021)
Country	China
Study design	Prospective cohort study
Sample size, male (N or %) & Diagnosis (N or %)	All = 162 Intervention group: 84 Control group: 78 intervention group: 44 control group:42
Measurement tools	Assessment for test and retest= The Chinese version of the PPVT-R[13] (The Peabody Picture Vocabulary Test-Revised) Intervention= the JingYun Rehab Cloud Platform
Results	-A significant main effect of pre-posttest: F (1,160) = 131.56, P < .001, η2 = 0.45 -Post vs prerehabilitation in PPVT-R test= significantly larger -Prerehabilitation between 2 groups: did not significantly -Main effect of group in post: (the intervention group vs the control group): F (1,160) = 2.88, P = .092, η2 = 0.018 -Interaction effect between the test time and group: F (1,160) =14.12, P < .001, η2 = 0.081 (a significant interaction effect) & (significant for postrehabilitation)

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	Feasibility and acceptability of a real time telerehabilitation intervention for children and young adults with acquired brain injury during the COVID-19 pandemic: an experience report
First Author, (year)	Oprandi (2021)
Country	Italy
Study design	An experience report
Sample size, male (N or %) & Diagnosis (N or %)	All=13 Male=8 Diagnosis= Traumatic Brain Injury + Brain Tumor + others
Measurement tools	Instrument for intervention= a personal computer+ microphone+ Google Meet Measurement of treatment effects: Two questionnaires (parents + therapists)
Results	Therapists' Questionnaires Feasibility: Sound quality = M (SD): 4.4 (0.2) Signal reception= M (SD): 4.4 (0.2) Image quality = 4.3 (0.2) Acceptability: -Quality of the therapeutic relationship with the patient= 4.6 (0.2) -Degree of control over the patient during treatment= 4.3 (0.2) -Attainment of clinical goals= 4.5 (0.2) -Degree of patient's compliance with the instructions given by the therapist= 4.5 (0.1) -Highest score= Sound and signal quality -Lowest= Image quality Parents' Questionnaires Feasibility: -Image and sound quality= 2.6 (0.6) Acceptability: - relationship between them= 3.0 (0) -Concern about client treat from distance by therapist= 1.0 (0.2) -Usefulness of treatment= 2.9 (0.2)

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	Tomaiuoli (2021)	Italy	A non-randomized controlled pre- and post-treatment trial	Experimental group (Telepractice Group): All=11 children who stutter Male=10 receiving telehealth adaptation of MIDA-SP[14] (Multidimensional, Integrated, Differentiated and Art-mediated stuttering program) Historical control group (In-Clinic Group): All=11 children who stutter Male=10 receiving MIDA-SP at Center of Research and Cure (CRC) based in Rome	Intervention= The MIDA-Stuttering Program Primary outcomes: Stuttering Severity Instrument – Fourth Edition (SSI-4[15]( ) End of the treatment: OASES[16] (Overall Assessment of the Speaker's Experience of Stuttering)	Telepractice Group: -SSI-4 total score pre and post treatment: t10 =3.978; p=0.003 and -OASES Total Score pre and post treatment: t10=4.224; p=0.002 and SSI-4 total score pre and - In-Clinic Group: -Post treatment t10=4.071; p=0.002 and OASES Total Score pre and post treatment t10=3.778; p=0.004 and Pre- and post-treatment assessments of the two groups on the SSI-4 test: SSI-4 pre: t20=-0.139; p=0.891 Mann Whitney U= 62.5; n1 = n2 = 11; p= 0.898 SSI-4 post: t20=-0.815; p=0.425 Mann Whitney U =75.5; n1 = n2 = 11; p= 0.332 Pre- and post-treatment assessments of the two groups on the OASES's Total Score: Pre-treatment: t20=-1.288; p=0.213 Mann Whitney U = 86.5; n1 = n2 = 11; p= 0.088 Post-treatment: t20=-1.211; p=0.240 Mann Whitney U = 78; n1 = n2 = 11; p= 0.270 Comparison of Missed Appointment Rate for In-Clinic and Telepractice Group: t20=-0.64; p=0.530 Mann Whitney U =70; n1 = n2 = 11; p= 0.562

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	Speech pathology telepractice for children with cleft palate in the times of COVID-19 pandemic
First Author, (year)	Pamplona (2020)
Country	Mexico City
Study design	Clinical trial
Sample size, male (N or %) & Diagnosis (N or %)	All=43 with VPI[17] (velopharyngeal insufficiency) and CA[18] (compensatory articulation) after palatal repair
Measurement tools	Treatment: according to the phonologic principles of the WLM[19] (Whole Language Model) Sessions of treatment= 2 sessions per week, 1 therapy session and 1 choir session The articulation strategies= Modeling, modeling with stress, cloze procedure with phonemic cues, phonetic changes, and think aloud in phonemic awareness
Results	A Two tailed Wilcoxon rank sum test: -A statistically significant difference between the two-paired samples (onset as compared to end) = significant improvement in study group ($p < 0.001$)

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	An exploratory study of speech-language pathologists' clinical practice in the literacy domain: Comparing onsite practices with telepractice services during COVID-19
First Author, (year)	Furlong (2022)
Country	Australia and New Zealand
Study design	Online cross-sectional survey
Sample size, male (N or %) & Diagnosis (N or %)	44 SLPs
Measurement tools	Online survey
Results	Caseload and service delivery prior to COVID-19: -Average= 6 and 10 (n=6) and 11–15 (n=6) students per week -Caseload and service delivery during COVID-19: -Seeing fewer students, n=30 -For individual literacy sessions= most participants no change to session -Change in session duration for small groups= yes -Literacy assessment for onsite delivery and telepractice delivery: More than half of the participants (n=25) = no change. Changes to intervention practices for telepractice Delivery: -Nearly half (n=20) = a little change= several changes (n=10) + significant changes (n=6) Telepractice literacy services: -Prior to the COVID-19= none of literacy caseload were seen via telepractice -During the COVID-19= seeing more than 75% of their literacy caseload via telepractice -Reasons caseload seen via telepractice changed during COVID-19: government-enforced restrictions + change to schools closing and being unable provide onsite services + need for continued access to services

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

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Country	Australia and New Zealand
Study design	Online cross-sectional survey
Sample size, male (N or %) & Diagnosis (N or %)	44 SLPs
Measurement tools	Online survey
Results	-The main reason for continuing with telepractice= Student preference -Next most common reason= The flexibility and convenience of telepractice + reduced travel time for families + increase in referrals from rural -Reasons for not continuing= preference for providing onsite services+ scheduling difficulties during school hours + limited access to internet and devices for some students. -Most participants (n=37) = differences between onsite and telepractice, -Most commonly differences = more difficulty maintaining students' attention and engagement in telepractice sessions (n=11) + difficulties detecting nonverbal cues and seeing the student working in telepractice sessions + less able to provide timely and accurate feedback (n=8) + technological challenges in telepractice sessions (n=7)+ more reliance on parents to support students in telepractice sessions (n=3) + parents needed to be more involved (n=3) -More than half = no difference in intervention outcomes -Barriers with implementing telepractice: most= technological challenges+ families not wanting to esngage+ lack of appropriate resources

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
The effectiveness of speech pathology telepractice during COVID-19 pandemic for Autistic children in Indonesia	Aliffia (2023)	Indonesia	Pre-post	16 ASD[20] (autism spectrum disorder)	Speech therapy telepractic program	Differences between pre and post intervention: z=-2.529, P= 0.011
Outcome measures following tele-rehabilitation and conventional face to face rehabilitation in paediatric cochlear implant users during COVID-19 pandemic: A pilot study in a tertiary care setup	Verma (2022)	India	Pre-post	27 unilateral paediatric cochlear implants (two intervention groups: vis,tele & face-to-face intervention)	Assessment tools: ISD[21] (Integrated Scale of Development), SIR[22] (Speech Intelligibility Rating Scale), CAP-R[23] (Revised Category Auditory Perception) Intervention: WhatsApp video calling platform, conventional face-to-face therapy	-Conventional rehabilitation better outcomes compared to teletherapy. -Rate of progress after one year of rehabilitation with respect to hearing-age: significant difference for the hearing-age group of 0-2 years across the domains of audition, speech and language

Table 2: The efficacy of available tele practice speech therapy during the COVID-19

Title	First Author, (year)	Country	Study design	Sample size, male (N or %) & Diagnosis (N or %)	Measurement tools	Results
Artificial intelligence evaluation of COVID19 restrictions and speech therapy effects on the autistic children's behavior	Sabzevari (2023)	Iran	Survey	87 children with ASD	3 treatment approaches of in-person, telehealth and public services along with no-treatment condition	-Restrictions alleviate externalizing problems, intensifying internalizing problems. - In-person speech therapy most effective and satisfactory approach to deal with ASD children during stay-at-home periods. -The effectiveness of the treatments in person= 69.6% -Satisfaction telehealth: minimum satisfaction -No treatment: have satisfactions. -Partial treatment from public health service: no impact on the satisfaction -Level of satisfaction: effects on change in behavior of their children

(Footnotes)

1. CELF-5: The Clinical Evaluation of Language Fundamental
2. SALT: Systematic Analysis of Language Transcripts
3. MLU: mean length of utterance
4. NDW: Number of different words
5. TTR: type–token ratio
6. Prebaseline: outcome measures 3 months before the intervention
7. Baseline: outcome measures 1 week before the Intervention
8. T1: outcome measures immediately after the intervention
9. T2: outcome measures at a 3-month follow-up
10. PVB: Primo Vocabolario del Bambino (A language inventory)
11. Wc: word comprehension
12. Wp: word production
13. PPVT-R: The Peabody Picture Vocabulary Test-Revised
14. MIDA-SP: Multidimensional, Integrated, Differentiated and Art-mediated stuttering program
15. SSI-4: Stuttering Severity Instrument – Fourth Edition
16. OASES: Overall Assessment of the Speaker's Experience of Stuttering
17. VPI: velopharyngeal insufficiency
18. CA: compensatory articulation
19. WLM: Whole Language Model
20. ASD: Autism Spectrum Disorder
21. ISD: Scale of Development
22. SIR: Speech Intelligibility Rating Scale
23. CAP-R: Revised Category Auditory Perception

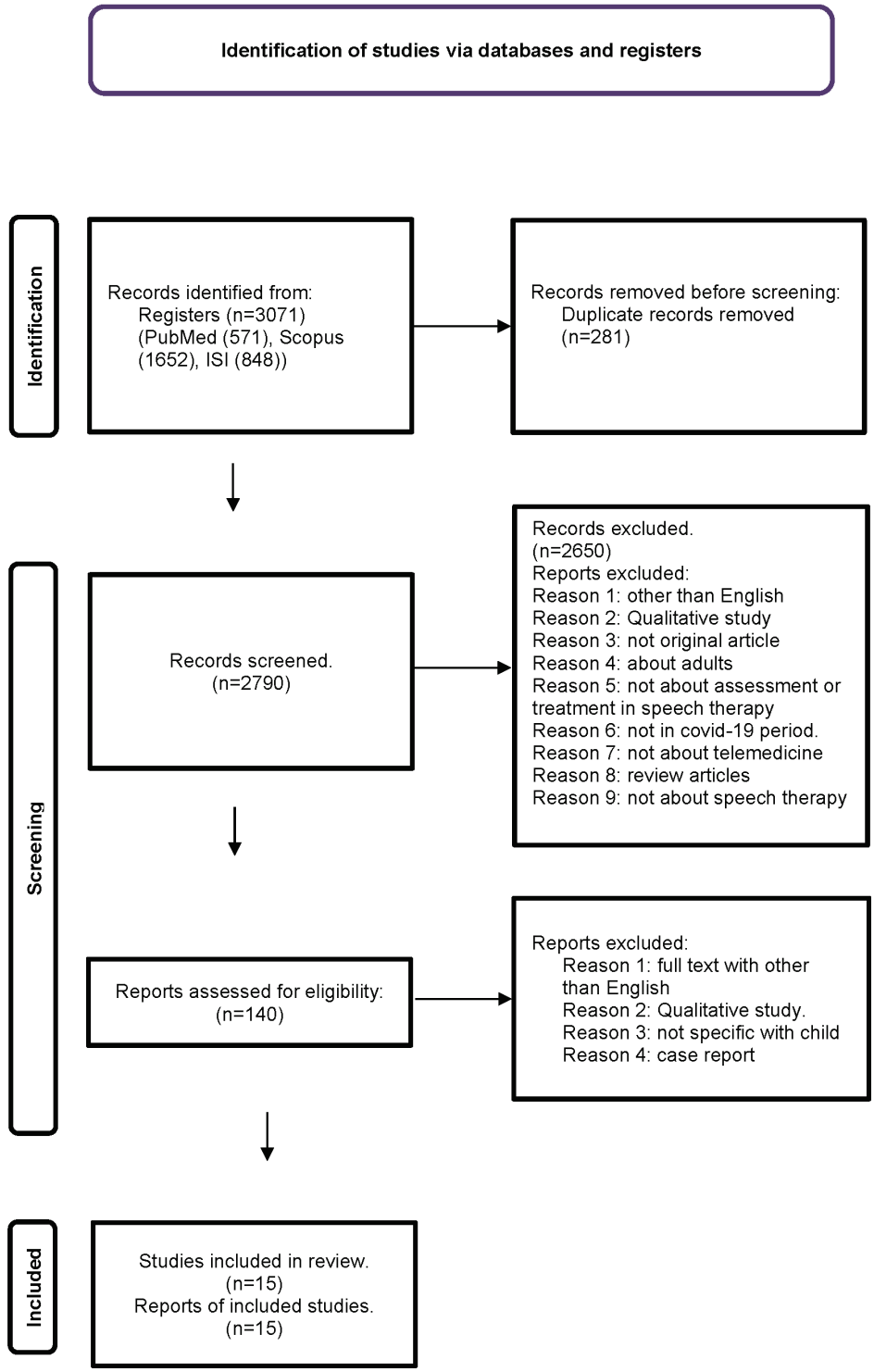

***Figure 1**: Characteristics of included studies*

Discussion

The present scoping review aimed to compare the amount of telepractice and face-to-face speech therapy delivery for children during COVID-19 and the barriers and facilitators of telepractice speech therapy delivery during the pandemic. Furthermore, we reported the efficacy of present telepractice speech therapy during COVID-19.

The included studies showed that approximately all SLPs used telehealth to assess, intervene,

and counsel children with swallowing and communication disorders during the pandemic. These findings are consistent with other reports, such as a May 2020 survey by ASHA (ASHA, 2020) that revealed over 80% of school-based SLPs surveyed were routinely using teletherapy, whereas prior to COVID-19 only 5.2% of those SLPs provided services via teletherapy (27).

The SLPs and parents believed that telepractice had many advantages, and they preferred to continue telepractice therapy after the pandemic. Moreover, they need to apply face-to-face therapy too. In this way, Lam et al. demonstrated that telepractice services improved students' speech and language abilities and increased their engagement with speech-language therapy and their motivations for learning(34). Grogan-Johnson et al. applied conventional speech therapy in a rural setup in the USA. They reported that online speech therapy cannot substitute face-to-face speech therapy but can be used along with it to achieve a better outcome (35).

This scoping review determined some barriers and facilitators for online speech therapy during the pandemic. Some barriers include technology and a lack of clear resources for connecting SLPs and their clients. For these kinds of problems, the health policymaker should be used the experience of the COVID-19 pandemic and predict the necessary resources for similar disasters.

On the other hand, SLPs reported some barriers (12, 28). Some SLPs reported the lack of guidelines for telepractice speech therapy, lack of experience about telepractice, and the difficulty of online speech therapy for children. In this way, the (ASHA) demands that quality of service provided through telepractice speech therapy be equivalent to face-to-face speech therapy but not less than face-to-face speech therapy (36). So, if the clinicians have decided to continue the telepractice must provide adequate resources such as various applications and programs for children with different disabilities. In addition, the speech and language associations provide the telepractice guidelines and hold educational courses for clinicians.

Furthermore, parents and students reported some barriers, such as difficulty managing children, needing more time for intervention, and less concentration in online sessions. In telepractice sessions, parents need to solve technological problems and control students' behaviors throughout the session. Therefore, parents must allocate more time and energy to telepractice sessions than on-site sessions, which is unavoidable (34, 37). In addition, more communication between parents and SLPs is needed to achieve more efficacy of telespeech therapy because parents are responsible for treatment transfer to their children. However, the presence of face-to-face communication is needed for more efficacy. In addition, the nature of online communication is so difficult for children. The lack of effective communication in telehealth can explain this negative opinion. Due to the lack of personal interaction in telehealth services, extra communication and visual features for communication are needed to build adequate communication (38). According to the included studies in this scoping review, few experimental studies were about online speech therapy for children during the COVID-19 pandemic. The results of these studies support the effectiveness of a telepractice-based speech and language therapy intervention or no differences between online and face-to-face speech therapy. Many previous studies indicated that telepractice

programs improve communication in children with neurodevelopmental disorders (39-41). On the other hand, face-to-face therapy was more effective than telerehabilitation in children with CI. Chadd et al. assessed the impact of COVID-19 on Speech-Language Pathologists and their patients and reported that teletherapy for the pediatric population is challenging (42).

Reviewing the related articles revealed weaknesses in their methodologies and structures, such as the lack of a control group or sufficient study participants and no comparison between tele practice and face-to-face intervention. Moreover, they did not report the tele practice structure.

In Conclusion

This study revealed that tele practice services were limited before COVID-19 compared to during COVID-19. However, access to the service is challenging. Despite its advantages and disadvantages, SLPs and caregivers were willing to use telehealth speech therapy. However, the quality of service provided is questionable due to the lack of appropriate training for service delivery through tele-mode.

Limitation

This scoping review revealed gaps in these available studies about their methodology. For future studies, using a control group and comparing telehealth and face-to-face treatment is suggested. In addition, the researcher should assess an outcome measure by follow-up of participants' skills.

In addition, some articles were published in other languages and inevitably were excluded from the present study.

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Author's contribution

F.Hassanati: contributed to searching the databases, Data analysis, and preparing this article; M. Takaffoli: Searched the database; H. Mowzoon: Data analysis; Z. Nobakht: Searched the databases, Data analysis; and F. Soleimani M. Vameghi: revised the manuscript.

Conflict of interest

The authors have declared no competing or potential conflicts of interest

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