ORIGINAL ARTICLE

A scoping review of augmentative and alternative communication (AAC) telepractice research (2002-2021)

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ABSTRACT

Background: The emerging practice of tele-AAC (telepractice in augmentative and alternative communication) is gaining attention. Mapping existing research is necessary to help guide clinicians, characterize knowledge gaps, and identify future research directions.
Objectives: This study aimed to describe tele-AAC studies' quantity, research characteristics (i.e., rationale, objectives, methodology), and investigated services (i.e., service type, provider, mode, etc.).
Methodology: The scoping review involved four phases (search, selection, extraction, synthesis) and covered published and unpublished studies disseminated between 2002-2021. Information sources searched include 12 databases or repositories and six conference websites. For selection and extraction, two independent reviewers reviewed each document and the team resolved discrepancies by consensus. The extracted data were coded and synthesized quantitatively and narratively.
Results: Thirty unique studies were included. The majority were published (n = 24; 80%), conducted in developed countries (n = 29; 97%), investigated service efficacy (n = 21; 70%) and/or stakeholders experiences (n = 18; 60%), used experimental designs (n = 19; 63%), and involved 2-3 AAC users (n = 10; 33%). The studies focused on training and/or coaching services (n = 19; 63%), high-tech AAC (n = 20; 67%), developmental disabilities (n = 20; 67%), and services provided by speech-language pathologists (SLPs) (n = 15; 50%) or AAC researchers (n = 10; 33%). Most services were synchronous (n = 20; 67%) and home-based (n = 20; 67%).
Conclusion: Telepractice offers multiple, innovative ways to maximize AAC access and outcomes. Although preliminary data are available, the investigated populations, settings, and service delivery modes can be more diverse. Future researchers are recommended to use less bias-prone designs.

Introduction

Augmentative and alternative communication (AAC) refers to using one or more communication methods to compensate for limitations in producing or understanding speech [1,2]. AAC strategies may be unaided (e.g., gestures, sign language) or aided, and the latter can be low-tech (e.g., communication boards) or high-tech (e.g., tablets with AAC apps with text-to-speech features) [2]. When an AAC system is aided, it is considered a form of assistive technology, which is anything that helps people with disabilities function better [1]. In developed countries, AAC services are typically offered in specialized multidisciplinary rehabilitation centers, together with related assistive technology services like wheelchair fitting and measurement (e.g., the Rancho Los Amigos National Rehabilitation Center [3]). Although speech-language pathologists (SLPs) are key personnel, an AAC team is ideally multidisciplinary [4]. Depending on the need, it may include occupational therapists, physical therapists, special education teachers, nurses, etc., in addition to the clients and caregivers themselves [2].

Despite the demonstrated and potential benefits of AAC to children (e.g., language development, literacy, reduction in challenging behaviors) [5] and adults (e.g., better work, healthcare, and community participation) [6], many individuals worldwide do not have access to services due to the lack of adequately trained professionals [5]. In the Philippines, for example, a 2015-2016 survey showed that more than half (59-89%) of speech-language pathologists did not consider themselves to be competent in delivering AAC services [7]. Recognizing the profound unmet need for various rehabilitation services worldwide, the World Health Organization (WHO) introduced the Rehabilitation 2030 initiative in 2017 as a call for coordinated global action to make rehabilitation available for everyone [8].

One strategy to increase access to AAC and other rehabilitation services is telepractice or telerehabilitation, an approach mentioned in the WHO's 2019 meeting on the Rehabilitation 2030 initiative (Russian Ministry of Health representative) [8]. *Telepractice* refers to the use of telecommunications technology to remotely provide services [9]. Services can be delivered synchronously (i.e., in real time) and/or asynchronously (i.e., when data is recorded for later interpretation) [9]. They can also be used in conjunction with in-person services. When more than one mode is used (e.g., synchronous and asynchronous, telepractice and in-person), services are considered "hybrid." Regardless of mode, telepractice allows clinicians to serve clients in rural/remote areas [10] and continue providing services despite clinician/client travels, community mobility restrictions, or natural disasters [11]. These benefits suggest that AAC services delivered through telepractice, or 'tele-AAC,' can be useful in low-resource areas with a lack of access to such services.

Regardless if increasing access to AAC services is the motivation or not, researchers seem to find it valuable enough to conduct preliminary studies on its feasibility, acceptability, and efficacy (e.g., [12,13]). However, while some studies on tele-AAC exist, the evidence as of 2021 appeared to be limited [14]. Additionally, no reviews had been made then, so the nature and exact degree of the scarcity were unknown.

There was a need to summarize research efforts directed at tele-AAC as telepractice had recently become more relevant to speech-language pathology in general. Compared to only 11% of American SLPs doing telepractice in 2002 (American Speech-language Hearing Association, 2002, as cited in [15]), 64% of them did so in 2016 [16]. The COVID-19 pandemic also precipitated a rapid global shift to telepractice at the end of the decade [17]. This includes the Philippines, despite being challenged by

innumerable barriers (e.g., limited knowledge on telepractice, infrastructure limitations, internet connection issuess) [18]. Whereas 0% of the 277 Filipino SLPs surveyed by the Philippine Association of Speech-language Pathologists did telepractice in 2019 [19], 82% (47/57) of selected pediatric practitioners surveyed in 2022 did so [20].

There are no data on the number of Filipino SLPs engaged in tele-AAC per se, but the trend in other countries suggests an increasing interest. For instance, a national survey in the United States showed that 329 out of 394 SLPs (84%) engaged in telepractice to serve at least one AAC user during the pandemic [21]. Considering SLPs' increasing engagement in tele-AAC, a summary of the available evidence might help them navigate this emerging practice. It may also lend itself to the identification of research gaps and strategic research directions, both of which might help accelerate research production.

To help address the lack of such a summary in 2021, and considering how the evidence base seemed premature for a systematic review, a scoping review was conducted. The review aimed to describe tele-AAC studies in terms of their quantity (across countries, over time), their research characteristics (i.e., rationale, objectives or aspects of tele-AAC they investigated, methodology), and the nature of the tele-AAC services they investigated (e.g., service provider, type of service, clinical setting, service delivery mode). A scoping review is a type of research synthesis that aims to "map the literature on a particular topic or research area and provide an opportunity to identify key concepts; gaps in the research; and types and sources of evidence to inform practice, policymaking, and research" [22]. A scoping review may offer clinicians ideas on evidence-based approaches that may benefit clients. It may also provide researchers with potential topics and methods for future tele-AAC studies.

Methodology

This scoping review had four phases: search, selection, data extraction, and data synthesis. All were carried out according to JBI's (previously the 'Joanna Briggs Institute') guidelines [23]. Figure 1 (PRISMA flow diagram) shows an overview of the review's actual proceedings. These events are congruent with the review protocol prospectively documented and filed in the University of the Philippines Manila Research Ethics Board's archives (UPMREB 2021-279-EX). Only minor deviations from the plan (i.e., data presentation strategies) took place.

Search

A preliminary search on MEDLINE (Pubmed) and Google Scholar was conducted to identify terms used in the titles, abstracts, and index terms of relevant articles. Additional terms were identified from MEDLINE's MeSH database and the introductory chapter of a textbook on telepractice in speech-language pathology [24]. All the identified terms were combined to create a
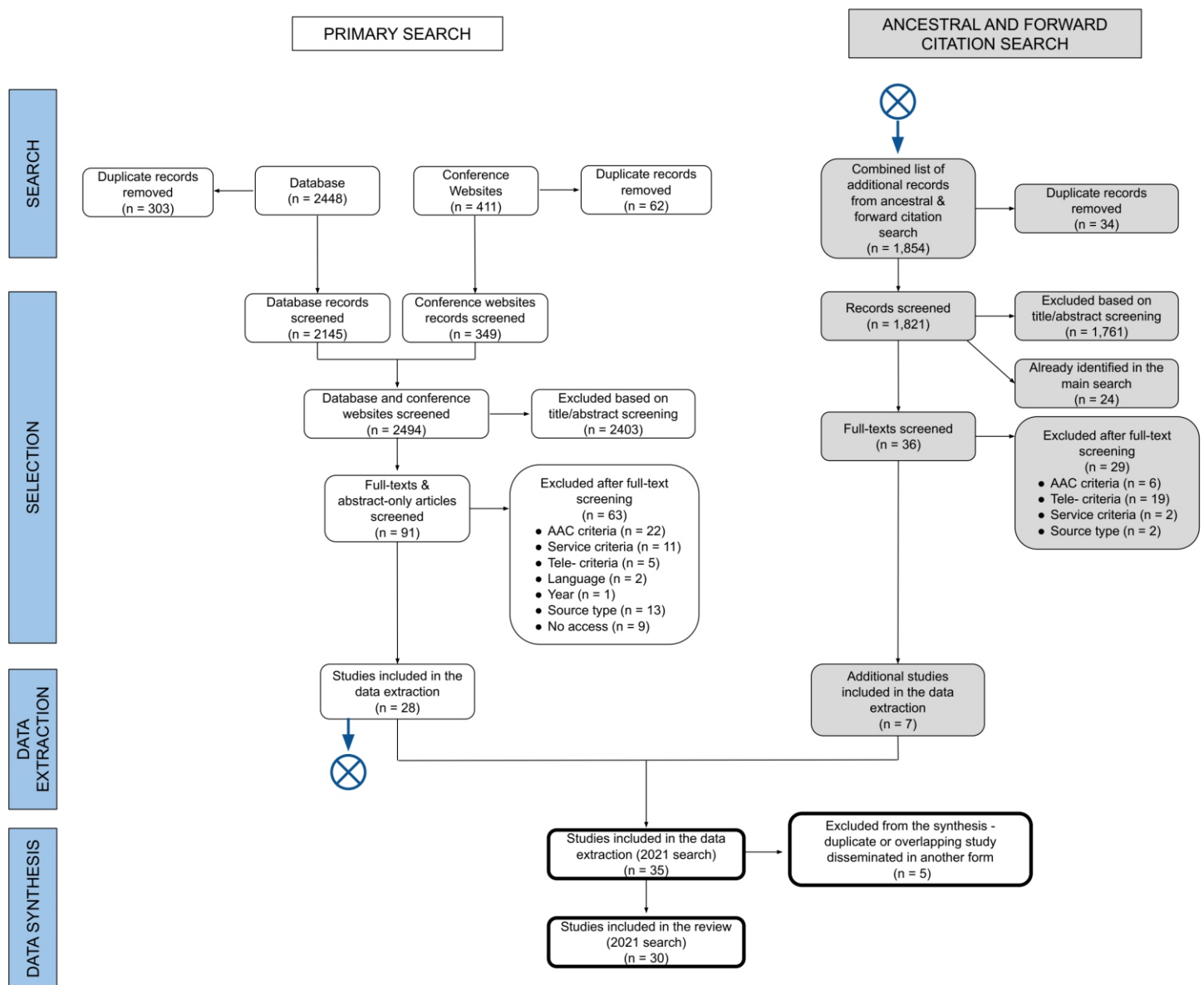

Figure 1. PRISMA Flow Diagram: Scoping Review of Tele-AAC Studies (2002-2021)

search string for MEDLINE (Figure 2). This string was then modified to fit the search engines of other databases or repositories: CINAHL Complete (EBSCO), Gale Academic OneFile, ProQuest One Academic (ProQuest Central, Academic Complete, Academic Video Online and ProQuest Dissertations & Theses Global), Scopus (Elsevier), ERIC, Google Scholar, LILACS, SciELO, Perspectives of the ASHA Special Interest Groups (ASHAWire), OSF, and ResearchGate. Aside from searching these electronic databases, manual searching was also conducted on the conference websites of these AAC or assistive technology groups: International Society for AAC, AGOSCI (previously the 'Australian Group on Severe Communication Impairment'), Communication Matters, AAC Institute, Assistive Technology and AAC (ATAAC) EU, Assistive Technology Industry Association, and Rehabilitation Engineering and Assistive Technology Society of North America. Apart from the conference websites and ProQuest One Academic, there were no other repositories searched for gray literature. The database and manual searches were conducted between March 26 to May 7, 2021. Citations identified from this two-pronged search strategy were collated in Google Sheets. Duplicates were removed.

Selection of Studies

In terms of evidence source type, studies were included if they were written in English (original or translated) and published between 2002-2021. No AAC-focused telepractice studies were identified by a 2001 search [25], so it was inefficient to look for older articles. Since tele-AAC appears to be an emerging area of research, both published and unpublished articles were included as long as there was evidence of research being conducted (i.e., commentaries, tutorial papers, etc. were excluded). To ensure that only relevant articles would be included, a screening flowchart (Figure 3) was developed. This flowchart reflects the eligibility criteria presented in Table 1. Prior to selecting studies from the compiled search results, the team practiced independently screening 25 titles and abstracts against the eligibility criteria. The team's inter-rater reliability was 84%, which is acceptable as the JBI's recommendation is 75% [23]. The group discussed disagreements and edited the flowchart to improve the team's reliability. After the practice phase, title and abstract screening commenced with each article being assigned to two independent screeners. Disagreements were resolved by discussing them until the entire team reached a consensus. Articles that passed the title and abstract screening advanced to full-text screening. Disagreements here were also discussed until everyone agreed. To ensure a comprehensive search, forward citation and ancestry searches were also conducted based on the eligible full texts. The former was done using the 'cited by' feature of Scopus and Google Scholar. The forward citation search was done on September 7, 2021. The ancestry search was conducted by examining the references of the included studies. Results from both searches were compiled in a spreadsheet and studies identified underwent the same multi-level screening process. The team's inter-rater reliability was 97.42% (title/abstract screening) and 78.74% (full-text screening). Most discrepancies were related to whether AAC services were actually provided or not (see exclusion criteria in Table 1).

Search string used: ("teleAAC" OR "tele-AAC") **OR (**(("augmentative and alternative communication" OR "alternative and augmentative communication" OR "augmentative communication" OR "alternative communication") OR ("communication board" OR "communication boards" OR "speech generating device" OR "speech generating devices" OR "speech-generating device" OR "speech-generating devices" OR "Communication Aids for Disabled"[MeSH] OR "communication aid" OR "communication aids")) **AND** (("telepractice" OR "tele-practice" OR "Telerehabilitation"[MeSH] OR "telerehabilitation" OR "tele-rehabilitation" OR "virtual rehabilitation" OR "teletherapy" OR "tele-therapy" OR "telehealth" OR "tele-health" OR "e-health") OR ("remote" OR "distance" OR "online") OR ("videoconference" OR "videoconferencing" OR "video-conference" OR "video-conferencing" OR "teleconference" OR "teleconferencing" OR "tele-conference" OR "tele-conferencing" OR "telecommunication" OR "telecommunications" OR "tele-communication" OR "tele-communications")))**)**

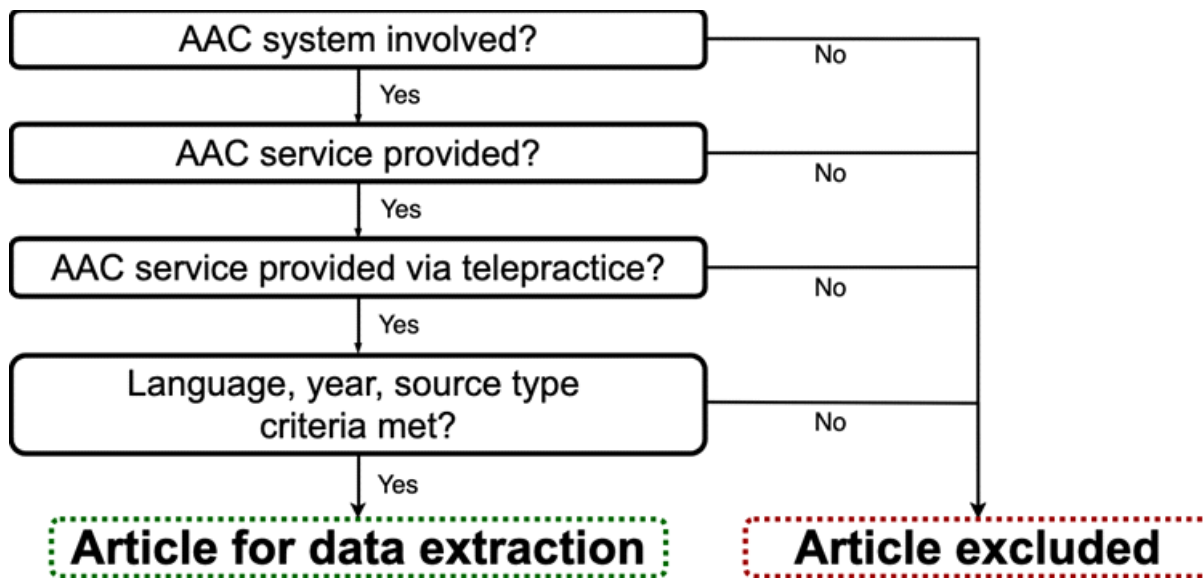**Figure 2.** Search Strategy Used in MEDLINE

Figure 3. Flowchart for the selection of studies

Table 1. Eligibility criteria

Inclusion criteria	Exclusion criteria
• Involved AAC	• Focused on communication but did not involve any AAC strategy • One or more participant(s) used an AAC strategy but study does not focus on AAC • Non-AAC assistive technology (e.g. , mobility, hearing) • e-health in general • Telepractice in general (not focused on AAC)
• AAC service was provided	• Involved the development of an AAC technology (no service delivered) • Programs for AAC users that did not focus on AAC (e.g. , leisure, employment) • Only collected data through online means (no AAC service delivered online) • Online continuing education
• AAC service was implemented via telepractice	• AAC service was delivered purely in person
• Written in English	• English translation of text not available
• Research was actually conducted (objectives, method)	• Grey literature with no objectives and methodology
• Published between 2002 - 2021	—

Data Extraction

Before extracting data from all the eligible full texts, the team piloted a data extraction form on one full text [13]. The form was modified based on the challenges encountered during the pilot (e.g., splitting some form fields into two, clarifying vague terms). Once the form was final, two team members were assigned to independently extract the following data from each full text: evidence source details (year of publication, type of source, country); research characteristics (rationale, objectives or aspects of tele-AAC investigated, design, data collection procedures, number of participants); nature of tele-AAC service investigated - who (service providers, service recipients, ages of clients with AAC needs, diagnoses of clients with AAC needs), what (service type, intervention approaches, intervention targets, AAC strategies/systems being trained), how (mode of delivery, equipment/hardware, software), where (clinical setting), when (session length, number of sessions, total length of service). Assigning two independent data extractors helps ensure the rigor of a scoping review [26]. In case of disagreements, all team members reexamined the full text to come up with the final data for that study. The team's justifications were also documented.

Synthesis of Results

The information extracted from all the studies was compiled in a spreadsheet and then analyzed using descriptive statistics. For quantitative data (i.e., session length, number of sessions covered, length of service, number of participants), measures of central tendency (i.e., mean, median, or mode) and dispersion (i.e., range) were obtained. For qualitative data, one of these three approaches was employed to quantify the text [26]: 1) straightforward frequency counts (e.g., counting all the studies that were journal articles) or frequency counts after grouping synonymous terms (e.g., 'speech-language pathologists' and 'speech-language therapists' under 'SLP') and terms belonging to the same non-conceptual category (e.g., 'Zoom' and 'Skype' under 'video-conferencing app'), 2) frequency counts after coding the data based on a "framework with single-word responses" (e.g., 'none' or 'yes/hybrid' for the 'involvement of in-person services' field; 'descriptive', 'exploratory', or 'experimental' for the 'research design' field), 3) frequency counts after doing a "qualitative content analysis." A content analysis differs from a thematic analysis, which is more appropriate for qualitative evidence syntheses, as it involves only rudimentary descriptive coding [23]. The content analysis was carried out mostly deductively (i.e., with an a priori framework [26] based on the AAC literature), although additional categories had to be added when an item did not fit the existing framework. For example, 'occupational performance' was added to the list of codes for intervention targets, which then included only well-known targets like 'linguistic competence,' 'social competence,' 'operational competence,' and 'strategic competence.' Since there were no existing frameworks for the 'research rationale' (i.e., distance barriers, COVID, generalization, etc.) and 'aspect of service delivery' (i.e., service efficacy, experiences, etc.) fields, these data were coded inductively. This means that a coding framework was developed from scratch based on the data [26]. To maintain rigor, the team referred to a codebook with descriptions and example entries for each code. For the 'assessment focus areas' and the 'assessment/intervention procedures' fields, the areas or procedures

investigated were so diverse that a quantitative summary would not have been meaningful. The strategies were, therefore, simply listed, and when appropriate, categorized for ease of reporting. For example, 'prompting hierarchy' and 'forward chaining' were listed under 'cuing or behavioral procedures.'

Results

Overview of Included Studies

As shown in Figure 1 (PRISMA flow diagram), a total of 35 evidence sources (i.e., journal articles, conference presentations, etc.) were eligible, with 30 being unique. The other five sources were not included because their data overlapped or repeated that of another source: Barrett's 2019 thesis [27] (duplicate of Barrett's 2021 journal article); Simacek et al.'s 2016 dissertation [28] (duplicate of Simacek's 2017 journal article [29]); Hall et al.'s 2014 conference presentation [30] (subset of study described in Hall's 2013 dissertation [31]); Jinks and Simpson's 2012 conference paper (subset of study described in LoPresti, Jinks, and Simpson's 2015 journal article [32]); Timpe's 2016 dissertation [33] (duplicate of Timpe's 2021 journal article [34]). The 30 evidence sources that were included consisted of published journal articles (n = 24, 80%), conference presentations (n = 2, 7%), theses (n = 2, 7%), a dissertation (n = 1, 3%), and a doctoral capstone (n = 1, 3%). Table 2 shows an overview of these included studies [12,13,28,31,32,34–58].

Research Quantity

Most of the studies (n = 25; 83%) were released between 2013-2021, with at least one study being released per year. The remaining five studies were released in the decade prior (2003-2012). Services in the United States (n = 19; 63%) were the most researched, followed by those in Australia (n = 4; 13%) and Germany (n = 2; 7%). These other countries were featured in one study (n = 1; 3%) each: the United Kingdom, Canada, Sweden, Belgium/France/Switzerland, and Peru. The study in Peru [57] involved cross-country service provision, with the service provider being located in the United States.

Research Characteristics

The studies had various rationales for investigating tele-AAC. Most of them were motivated by distance barriers (n = 14; 47%) and shortage of service providers (n = 11; 37%), followed by the need for better generalization (i.e., carry-over of skills to natural settings; n = 8; 27%), personal constraints (i.e., preferences, scheduling conflicts, caregivers' other responsibilities; n = 7; 23%), financial barriers (n = 5; 17%), efficiency (i.e., maximizing productivity and outcomes without spending as much effort and/or resources; n = 5; 17%), and the COVID-19 pandemic (n = 2; 7%). Two studies (7%) did not specify their rationale.

In terms of research objectives, the majority of the studies investigated service efficacy (n = 21; 70%) and experiences (n = 18; 60%), while a few studies looked at client/clinician satisfaction (n = 6; 20%) and cost (n = 1; 3%). Studies

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Table 2. Characteristics of Studies Included in the Review (n = 30)

Data extracted	Styles (2008)	LoPresti et al. (2015)	Fissel et al. (2015)	Lindgren et al. (2016)	Simacek et al. (2017)	Dimian et al. (2018)
Country	UK	USA	USA	USA	USA	USA
AAC users served (age)	Late adulthood Early adulthood Middle adulthood	Not specified	Middle and late childhood	Infancy and toddlerhood Early childhood Middle and late childhood	Early childhood	Early childhood Middle and late childhood
AAC users served (diagnosis)	ASD, CP, DD/LD, Acquired neurologic impairment	Not specified	Other developmental neurological impairment	ASD, DD/LD	ASD	ASD, DD/LD, Other developmental neurological impairment
Service type	Assessment Consultation	Assessment	Assessment	Assessment Coaching	Assessment Coaching	Assessment Coaching
Assessment focus/targets	Not specified	Assistive technology selection	Literacy Linguistic competence	Challenging behaviors	Communication modalities and contexts	Symbol recognition Reinforcers/preferences Challenging behaviors
Intervention focus/targets				Social competence Challenging behaviors	Social competence	Operational competence Social competence
Assessment approach	Assistive technology assessment	Assistive technology assessment	Adapted assessment model based on different studies	*Structured descriptive assessment*	*Structured descriptive assessment*, Functional analysis	SDA, FA, Paired-choice preference assessment, vocabulary comprehension and correspondence assessment
Intervention approach				Functional communication training	Functional communication training, prompting hierarchy	Functional communication training, prompting hierarchy, forward chaining, errorless learning
Training/ coaching strategy (partner)	-	-	-	Not specified	Verbal instructions and feedback, modelling	Direct instruction
Mode of delivery	Tele (sync)	Group 1: Tele (sync) Group 2: Tele (sync), In-person	Tele (sync)	Tele (sync, async) In-person	Tele (sync)	Tele (sync)
Aspect(s) of tele-AAC investigated	Clinician/client satisfaction Experiences	Clinician/client satisfaction	Experiences	Cost Service efficacy	Service efficacy Experiences	Service efficacy
Research design	Descriptive (quanti-quali)	Experimental	Research review Descriptive (quanti-quali)	Experimental	Experimental	Experimental
Number of participants	12 clients, 15 SLPs, 14 caregivers	66 clients	1 client	50 clients	3 clients, 3 partners	2 clients, 2 caregivers

*studies that are not journal articles; ASD = autism spectrum disorder, CP = cerebral palsy, DD/LD = developmental disorders and/or learning disorders,

that investigated experiences cover descriptive accounts of service proceedings, and the feasibility, social validity, and/or acceptability of tele-AAC.

Regarding the studies' methodologies, most (n = 19; 63%) had an experimental design. Among these experimental studies, single-subject/single-case experimental designs (SCEDs; e.g., multiple baseline design, ABC/multiple-treatment design) were the most common (n = 15; 79%). The rest had a quasi-experimental design (i.e., pre-/post- design; n = 2; 11%) or an unspecified experimental design (n = 2; 11%). In addition to experimental studies, a few studies (n = 9; 30%) were descriptive (e.g., surveys, case studies) and two (7%) were exploratory (i.e., pre-experimental designs, grounded theory). One of the descriptive studies [36] also included a research review.

Data collection procedures with the highest frequency were offline observations (n = 19; 63%), real-time observations (n = 15; 50%), and questionnaires (n = 14; 47%). Other procedures included device logs (n = 5; 17%), interviews (n = 6; 20%), EEG recordings (n = 3; 10%), focus group discussions (n = 2; 7%), social media engagement statistics (n = 1; 3%),

literature reviews (n = 1; 3%), cost analysis (n = 1; 3%), and collecting measures of brain-computer interface setup quality (n = 1; 3%). One study (3%) did not specify their data collection procedures. In terms of the size of the participant pool, most studies (n = 10; 33%) involving clients as participants had 2-3 (min = 1, max = 66). Most of the studies (14/22, 64%) involving other participants (i.e., caregivers, professionals) also had 2-10 (median = 3, max = 36).

Nature of Tele-AAC Services Investigated: Who Were Served

Almost all the studies (n = 29; 97%) had clients with complex communication needs as direct or indirect service recipients. The second most featured group was caregivers (n = 21; 70%). Few studies involved non-SLP professionals (e.g., paraeducators; n = 4; 13%), SLP professionals (n = 1; 3%), SLP students (n = 1; 3%), and peer mentors (n = 1; 3%) as service recipients. The clients were mostly children in their early childhood (2 to <6 years old; n = 14; 47%), middle and late childhood (6 to <10; n = 9; 30%), and adolescence (10 to <18; n = 6; 20%). A few studies focused on adults in their early adulthood (25 to <45; n = 5; 17%), middle adulthood (45 to 65; n = 4; 13%),

Table 2. Characteristics of Studies Included in the Review (n = 30) - cont.

Data extracted	Roman et al. (2021)	Müller et al. (2003)	Neuper et al. (2003)	Hall (2013)*	Hall et al. (2014)	Macoir et al. (2017)	Geronimo & Simmons (2020)	Browder (2020)*
Country	USA	Germany	Germany	USA	USA	Canada	USA	USA
AAC users served (age)	Emerging adulthood Early adulthood Middle adulthood	Early adulthood	Early adulthood	Early childhood Middle and late childhood	Early childhood Middle and late childhood	Middle adulthood Late adulthood	Middle adulthood Late adulthood	Early childhood Middle and late childhood
AAC users served (diagnosis)	Acquired progressive impairment	CP	CP	ASD, Acquired neurological impairment, DD/LD	Other developmental neurological impairment	Acquired neurological impairment	Acquired neurologic impairment	Other genetic disorders
Service type	Assessment Direct tx Training	Direct tx	Direct tx	Direct tx Coaching	Direct tx	Direct tx	Direct tx	Direct tx Coaching
Assessment focus/targets	Assistive technology selection	Operational competence	Operational competence	Linguistic competence	Linguistic competence	General communication Strategic competence	Operational competence	Literacy
Intervention focus/targets	Operational competence							
Assessment approach	Assistive technology assessment	Adaptive training procedure for remote controlled BCI systems	Not specified	Augmented input	Models, recasts, contrastive statements	Promoting aphasic's communicative effectiveness (PACE)	Unnamed BCI training program	Accessible literacy learning (ALL) app
Intervention approach	Not specified							
Training/ coaching strategy (partner)	Direct instruction	-	-	Verbal prompts	-	-	-	Direct instruction
Mode of delivery	Tele (sync) In-person	Tele (sync)	Tele (sync)	Tele (sync)	Tele (sync)	Tele (sync)	Tele (sync) In-person	Tele (sync)
Aspect(s) of tele-AAC investigated	Experiences Clinician/client satisfaction	Experiences	Service efficacy	Experiences Service efficacy	Service efficacy	Service efficacy	Service efficacy	Service efficacy
Research design	Descriptive (quanti-quali)	Descriptive (quanti)	Descriptive (quanti)	Experimental	Experimental	Experimental	Experimental	Experimental
Number of participants	8 clients, 8 caregivers	1 client, 1 caregiver	1 client	4 clients, 4 SLP students, 2 SLPs	1 client, 1 caregiver	20 clients	15 clients, 15 caregivers	2 clients

ASD = autism spectrum disorder, CP = cerebral palsy, DD/LD = developmental disorders and/or learning disorders, BCI = brain-computer interface, Direct tx = direct intervention

and late adulthood (>65; n = 3; 10%). One study (3%) investigated infants and toddlers (0 to <2 years old). Three studies (10%) did not report the age of their service recipients. Looking at the clients' medical conditions, most studies (n = 20; 67%) involved those with developmental disabilities, such as autism spectrum disorder (n = 14; 47%), developmental delay or learning difficulties (n = 9; 30%), cerebral palsy (n = 7; 23%), Down syndrome (n = 4; 13%), other genetic disorders (n = 5; 17%), other developmental neurological impairments (n = 2; 7%), and ADHD (n = 1; 3%). A few studies (n = 6; 20%) involved people with acquired disabilities. Among these, one [39] (3%) included those with a progressive condition (i.e., Amyotrophic Lateral Sclerosis). Four studies (13%) did not specify the clients' diagnoses.

Nature of Tele-AAC Services Investigated: What Service(s) Were Provided

Table 3 shows the types of services investigated. More intervention studies (i.e., direct intervention, training, coaching) had been done relative to assessment studies and ancillary services (i.e., consultations, support groups). In terms of the specific intervention type, indirect interventions (i.e., training, coaching) were more common than direct ones.

The majority of the studies looked at services facilitated by SLP professionals (n = 15; 50%) and AAC researchers (n = 10; 33%). Other service providers included brain-computer interface engineers (n = 2; 7%), SLP students (n = 2; 7%), nurses (n = 1; 3%), behavioral specialists (n = 1; 3%), classroom aides (n =

1; 3%), general support group facilitators (n = 1; 3%), occupational therapists (n = 1; 3%), videoconferencing experts (n = 1; 3%), and peer mentors (n = 1; 3%).

In terms of the AAC strategies trained, 20 studies (67%) provided training for aided high-tech AAC strategies (e.g., iPads as speech-generating devices). Some studies provided training for low-tech strategies (e.g., communication boards; n = 5, 17%) and unaided strategies (e.g., gestures, key word sign; n = 5, 17%). Six studies (20%) did not report the AAC strategy.

Assessment areas (Table 4, left column) spanned traditional components of speech-language assessments (e.g., communication modalities, literacy) as well as those specific to AAC (e.g., symbol recognition) and assistive technology assessments (e.g., device selection). Regarding client-focused intervention targets (Table 5), communication in general and social competence (e.g., requesting, turn-taking) were investigated the most, with linguistic competence (e.g., vocabulary, grammar) and operational competence (e.g., navigating an iPad) being a close second. For studies that involved communication partner targets (Table 5), skills (e.g., aided language stimulation) were investigated more often than knowledge (e.g., core vocabulary).

Assessment strategies (Table 4, right column) included behavior-focused procedures (e.g., structured descriptive assessment), symbol or language-focused procedures (e.g., vocabulary comprehension assessment), and

Table 2. Characteristics of Studies Included in the Review (n = 30) - cont.

Data extracted	Douglas et al. (2013)	Douglas et al. (2017)	Douglas et al. (2018)	Huzmeli et al. (2018)*	Grace et al. (2019)*	Von Hellens (2020)*	Barrett (2021)	Sigafoos et al. (2004)
Country	USA	USA	USA	Australia	Australia	USA	USA	USA
AAC users served (age)	Early childhood	Early childhood	Early childhood	Early childhood	Adolescence	Middle and late childhood	Adolescence	Adolescence
AAC users served (diagnosis)	ASD, DD/LD	DS, CP, Other genetic disorder	ASD, DD/LD	DS	Not specified	ASD, ADHD	ASD, DS, CP	ASD
Service type	Training	Training	Training	Training	Training Support group	Training	Training	Coaching
Assessment focus/targets	General communication	General communication	General communication	Linguistic competence, Social competence	Social competence	Occupational performance	General communication	-
Intervention focus/targets								Social competence
Assessment approach	-	-	-	-	-	-	-	-
Intervention approach	POWR strategy (prepare activity, offer opportunities, wait, respond)	POWR strategy (prepare activity, offer opportunities, wait, respond)	POWR strategy (prepare activity, offer opportunities, wait, respond)	Creating a signing environment	Cross-age peer mentoring	Modelling	Modelling, expanding, recasting, wait time, pausing	Prompting hierarchy
Training/ coaching strategy (partner)	Online modules	Online modules	Online modules	Not specified	Direct instruction	Not specified	Behavioral skills training	Direct instruction
Mode of delivery	Tele (async) In-person	Tele (async) In-person	Tele (async)	Tele (sync, async)	Tele (sync, async)	Tele (sync, async) In-person	Tele (async) In-person	Tele (sync, async) In-person
Aspect(s) of tele-AAC investigated	Service efficacy	Service efficacy	Service efficacy	Service efficacy Experiences	Experiences	Service efficacy Experiences	Service efficacy Experiences Clinician/client satisfaction	Service efficacy
Research design	Experimental	Experimental	Experimental	Experimental (with quali data)	Exploratory (quanti)	Descriptive (quali-quanti)	Experimental (with quali data)	Experimental
Number of participants	3 clients, 3 other professionals	4 clients, 4 caregivers	3 clients, 3 caregivers	2 clients, 2 caregivers	4 clients	1 client, 1 caregiver	3 clients, 4 caregivers	1 client, 3 caregivers

ASD = autism spectrum disorder, ADHD = attention-deficit hyperactivity disorder, DS = Down syndrome, CP = cerebral palsy, DD/LD = developmental disorders and/or learning disorders

comprehensive assessment protocols (e.g., assistive technology assessment protocols). Intervention strategies (Table 6) encompassed approach-specific procedures used in direct intervention studies (e.g., brain-computer interface training) and more generic procedures featured in training or coaching studies. The latter included language stimulation procedures (e.g., aided language stimulation, expanding, recasting), cuing or behavioral procedures (e.g., prompting hierarchy, forward chaining), and other unique strategies (i.e., peer mentoring, teaching core vocabulary). Strategies used for training or coaching per se covered verbal instruction, audio-visual instruction (e.g., DVD lessons, online modules), and comprehensive programs (i.e., behavioral skills training, modified improving partner applications of augmentative communication techniques [ImPAACT] program), with the first two being more common.

Nature of Tele-AAC Services Investigated: How Were Services Provided

Services in 18 studies (60%) were delivered purely via telepractice, while 10 studies (34%) involved a hybrid (i.e., telepractice and in-person) setup. One study (3%) featured both since they involved two groups (i.e., telepractice only, telepractice and in-person services) [32]. One other study (3%) did not specify. Regarding the telepractice component, the majority of the studies (n = 20; 67%) investigated synchronous services. A few studies (n = 5; 17%) involved both synchronous and asynchronous services, or only asynchronous services (n = 4; 13%). One study (3%) did not report the mode.

In terms of the equipment used, more studies had service providers use audio-visual equipment (e.g., webcam, speakers; n = 13; 43%) and computers (n = 12; 40%) than telephones (n = 4; 13%), all-in-one videoconferencing systems (e.g., Polycom iPower 600; n = 3; 10%), and handheld devices (e.g., mobile phones; n = 3; 10%). Similarly, more studies involved clients using computers (n = 15; 50%) and audio-visual equipment (n = 13; 43%) compared to handheld devices (n = 7; 23%), telephones (n = 4; 13%), and all-in-one videoconferencing systems (e.g., n = 3; 10%). Thirteen studies (43%) did not specify the equipment used by the service providers, and seven studies (23%) did not report those used by the clients.

As for the telecommunications software used to facilitate the service, the majority of the studies (n = 18; 60%) used a mainstream video-conferencing app (e.g., Skype, FaceTime) or an app dedicated to telepractice (e.g., VISYTER, Oralys TeleTherapy Software). A few used email (n = 4; 13%), social media websites (e.g., Facebook groups; n = 2; 7%), and online course management systems (n = 2; 7%). Two studies (7%) did not use any (i.e., used only a telephone), and five studies (17%) did not specify.

Nature of Tele-AAC Services Investigated: Where and When Services were Provided

In terms of where clients were receiving services from, most studies (n = 20; 67%) investigated home-based services, while a few investigated services

Table 2. Characteristics of Studies Included in the Review (n = 30) - cont.

Data extracted	Boisvert *et al.* (2012)	Fage *et al.* (2018)*	Timpe (2021)	Anderson *et al.* (2014)	Douglas *et al.* (2021)	Wilder *et al.* (2015)	Vaughan (2018)*	Anderson *et al.* (2015)
Country	USA	Belgium/ France/ Switzerland	USA	Australia	USA	Sweden	Peru	Australia
AAC users served (age)	Adolescence	Not specified	Early childhood	Early childhood Middle and late childhood Adolescence	Early childhood	Not specified	Emerging Adulthood Early Adulthood	Early childhood Middle and late childhood Adolescence Emerging adulthood
AAC users served (diagnosis)	ASD	Not specified	DS	CP, DD/LD, ASD	ASD, DD/LD, Other genetic disorders	DD/LD	Other genetic disorders, Acquired neurologic impairment	ASD, CP
Service type	Coaching	Coaching	Coaching	Training, Coaching	Training, Coaching	Support group	Consultation	Not specified
Assessment focus/ targets **Intervention focus/ targets**	Social competence Linguistic competence	Social competence	Social competence Linguistic competence	General communication	General communication	Web-based blended learning networks (improving partners' knowledge)	Not specified	Not specified
Assessment approach **Intervention approach**	Aided language stimulation, modelling	Four-stepped intervention similar to the PECS protocol	Read-ask-answer strategy (RAA)	Core vocabulary, aided language modelling	Aided language modelling	-	-	-
Training/ coaching strategy (partner)	Active consultation	Personal or group mobile-app-based training (Tiwuouh app)	Modified improving partner applications of augmentative communication techniques (ImPAACT) program	DVD lessons	Direct instruction	-	-	-
Mode of delivery	Tele (sync)	Tele (sync) In-person	Tele (sync, async) In-person	Tele (sync, async)	Tele (sync)	Tele (sync)	Tele (sync) In-person	Not specified
Aspect(s) of tele-AAC investigated	Service efficacy Clinician/client satisfaction	Experiences Service efficacy	Service efficacy Experiences Clinician/client satisfaction	Experiences	Service efficacy Experiences	Experiences	Service efficacy, Experiences	Experiences
Research design	Experimental	Experimental	Experimental	Descriptive (quali)	Experimental (with quali data)	Descriptive (quali)	Descriptive (quali)	Exploratory (quali)
Number of participants	1 client, 1 other professional	Not specified	3 clients, 3 caregivers	4 caregivers	1 client, 4 caregivers	15 caregivers, 21 other professionals	2 clients, 2 caregivers	13 SLPs, 7 caregivers

ASD = autism spectrum disorder, DS = Down syndrome, CP = cerebral palsy, DD/LD = developmental disorders and/or learning disorders, PECS = Picture Exchange Communication System

delivered in the clinic (n = 5; 17%) [37,40,41,45,53], school (n = 3; 10%) [13,36,45], and hospital (n = 1; 3%) [35]. Four studies (13%) did not state the setting. Many studies did not report their services' intensity, but the available data were summarized nevertheless (Table 7). Studies that investigated mixed services were not included in this summary, except for one that involved both support groups and training. In terms of the minimum session length, 5-13 minutes was typical for all session types, except for direct intervention sessions, which were at least 30 minutes long. At the other end of the scale, 1-2 hours (60-120 minutes) was the norm for all service types, except for training sessions, which could last up to 4 hours (240 minutes [49]). The total number of sessions and the corresponding length of the services varied with some services lasting less than a week (e.g., one session [50]) and some lasting 4-5 months (e.g., [55,57]). The longest service (22 weeks) had as many as 178 sessions [41].

Discussion

State of Tele-AAC Research

This scoping review aimed to describe the quantity and research characteristics of tele-AAC studies disseminated between 2001-2021 as well as the nature of the services they investigated. The results show that at least 30 unique studies were released from 2003-2021, 24 (80%) of which were published journal articles. Research production had been constant, with at least one study disseminated every year since 2013, although the investigations were concentrated in developed countries. Most of these studies were experimental and small-scale (median of 2-3 participants) and primarily investigated service efficacy and/or stakeholders' experiences. The

Table 3. Types of Tele-AAC Services Investigated by the Studies Included in the Review

Service type	Description	Number of studies
Training	service providers instructing a family member or another professional in a skill outside the setting in which the skill will be used* (e.g., in a seminar held in a clinic conference room); includes topic-based knowledge transfer	11 (37%)
Coaching	service providers observing facilitators (e.g., a family member, another professional) use the target strategies in-context and providing them with some feedback on their performance*	10 (33%)
Assessment	service providers assessing clients with or without the assistance of a facilitator	7 (23%)
Direct intervention	service providers working directly with clients without the assistance of a facilitator	8 (27%)
Consultations	clients and/or caregivers consulting the service provider about setting up an AAC device, troubleshooting, etc.; clinicians asking caregivers and/or clients about how they are doing and whether they have any concerns or questions	3 (10%)
Support groups	clients, caregivers, and/or professionals share information, experiences, support, and advice with each other	2 (7%)
Not specified	(the description in the full-text was not enough to identify what service was provided)	1 (3%)

Note: Numbers do not add up to 30 since some studies investigated more than one type of service. *Definition from [73]

Table 4. Assessment areas investigated

Assessment focus areas	Assessment procedures
- device selection - challenging behaviors - communication modalities - symbol recognition - reinforcers/preferences - literacy - linguistic competence	Behavior-focused procedures - structured descriptive assessment (SDA) - functional analysis (FA) - paired-choice preference assessment Symbol-/language-focused procedures - vocabulary comprehension assessment - symbol correspondence assessment Comprehensive assessment protocols - assistive technology assessment - assessment protocol adapted from various studies

Table 5. Intervention targets investigated

Client targets	
Target	**Number of studies**
Communication in general	8 (27%)
Social competence (e.g., requesting, turn-taking)	8 (27%)
Linguistic competence (e.g., vocabulary, grammar)	5 (17%)
Operational competence (e.g., navigating an iPad)	5 (17%)
Strategic competence (i.e., working around social, linguistic, operational limitations)	1 (3%)
Literacy	1 (3%)
Occupational performance	1 (3%)
Challenging behaviors	1 (3%)
Communication partner targets	
Target	**Number of studies**
Skills	18 (60%)
Knowledge	4 (13%)

Note: The percentages do not add up to 100 because some studies investigated more than one of the targets.

researchers' most stated rationale for studying tele-AAC was the lack or distance of service providers. The studies included in the review covered a wide range of services. However, they focused on indirect services (i.e., training, coaching), SLP- or researcher-facilitated services, the needs of clients with developmental conditions (children in particular), the use of high-tech AAC strategies, and the development of partner/facilitator skills (e.g., aided language stimulation). Largely home-based, the tele-services were typically facilitated synchronously (i.e., through video-conferencing apps) and relied on computers more than handheld devices (e.g., mobile phones). Sessions usually lasted between 5 to 13 minutes and 1 to 2 hours.

Table 6. Intervention strategies investigated

Intervention strategies (direct intervention studies)	Intervention strategies (training/coaching studies)

• brain-computer interface training procedures
• promoting aphasic's communicative effectiveness (PACE)
• using the accessible literacy learning (ALL) app
	Language stimulation procedures
	  • aided language stimulation / augmented input / AAC modelling
	  • creating a signing environment
	  • expanding, reacting
	  • Read-Ask-Answer (RAA) strategy
	  • POWR (prepare activity, offer opportunities, wait, respond) strategy
	Cuing or behavioral procedures
	  • pausing/waiting
	  • prompting hierarchy
	  • forward chaining
	  • errorless teaching
	  • functional communication training (FCT)
	  • intervention similar to PECS (Picture Exchange Communication System) protocol
	Other strategies
	  • cross-age peer mentoring
	  • use of core vocabulary

Table 7. Intensity of tele-AAC services rendered

Service type	Session length (in minutes)		Number of sessions (in sessions, unless marked)		Length of service (in weeks, unless marked)	
	Range	n	Range	n	Range	n
Assessment	13-60	3	2-11	2	≤1-11	2
Direct intervention	30-120	4	8-178	5	3-22	5
Training	6-240	4	1-6 sessions/ modules	4	self-paced	1
					75 min. to 6 weeks	5
Coaching	10-60	5	2-20	4	2-10	3
Consultation	5-60	2	4	1	16	1
Support group	Not reported	-	113 contacts with 32 calls*	1	16*	1
			16	1		

Note: n = number of studies from which the range was based; this table does not include data from studies that did not specify the frequency and intensity of the services and those that investigated mixed services (except for the one marked with an asterisk – support group and training)

Lack of Tele-AAC data Relevant to Developing Countries

While a good number of tele-AAC studies exist, almost all of them were conducted in developed countries. Only one study [57] investigated service delivery in a low-resource country. This gap reflects a wider problem in the field of AAC. In a review done in 2022 [59], only 18 AAC studies were conducted in low to middle-income countries. Unsurprisingly, this gap is not unique to the AAC field. A review spearheaded by the WHO found that rehabilitation research in low- to middle-income countries is generally scarce [60].

While the available data on tele-AAC will be insightful nonetheless, some of them might have limited applicability to low-resource countries like the Philippines due to contextual differences (e.g., culture, healthcare system, resources) [59]. For one, the implementation of tele-AAC might be affected by how comfortable a community's members are in using technology, being videotaped, and undergoing training [61]. These barriers probably exist in the Philippines as a review showed that barriers to general telerehabilitation include a lack of technological know-how, concerns about privacy, and skepticism toward online services [18]. Tele-services in low-resource countries might also be hindered by technological barriers. In the Peru-based cross-country study covered by the review [57], for example, the service was interrupted by patchy internet connections, the lack of modern technology, and AAC-specific challenges external to the telepractice setup (e.g., high-tech AAC unavailable, language-appropriate AAC software unavailable).

Similar issues were identified by local studies on telerehabilitation or AAC in general: slow internet [18], lack of information and communication technology infrastructure [18], high cost of AAC technologies (i.e., tablets, AAC apps) [62] vis-a-vis the need for out-of-pocket financing [63], and the lack of AAC apps with Filipino vocabulary [7,63].

Less Research on Tele-AAC Services for Adults with Acquired Conditions

The relative lack of attention to tele-AAC services for adults with acquired conditions identified in this review contrasts with what had been found in a 2015 systematic review of telepractice studies in speech-language pathology at large. In this review, more studies on adults with aphasia, dysarthria, etc. were identified compared to those on children with language disorders, etc. [64]. This difference echoes the long-identified lack of research on services for adults in the AAC field in general [65]. The even scarcer work on tele-AAC services for progressive conditions (e.g., Parkinson's disease, multiple sclerosis) is particularly noteworthy; setting the telepractice component aside, this was also the case around 15 years ago [66]. More studies on adults with AAC needs are necessary as recent data from 11 high-income countries show that while people are living longer, they are also living more years with ill health and disabilities [67]. The Philippines seems to be following suit. Thirty years from now, 19.6% of its population may be senior citizens [68]. Considering how illnesses and disabilities may affect one's community mobility, these trends highlight the potential value of exploring telepractice

to meet this population's AAC needs. As adults with acquired conditions might require a different set of telepractice and AAC considerations, the data on those with developmental conditions might not apply.

Clinical Implications

This scoping review provides insights on how telepractice can be maximized to potentially increase access to AAC services and optimize outcomes. In the Philippines, AAC services are probably difficult to access due to the concentration of SLPs in Metro Manila [19] and the lack of SLPs who feel competent in this area [7]. To overcome these barriers, stakeholders can explore the creative solutions implemented by the studies in the review. First, clinicians can work with administrators to set up telehealth rooms in clinics (e.g., [57]), hospitals (e.g., [35]), or schools (e.g., [36]), where clients can remotely receive AAC services. Second, for clients and caregivers who find transportation to telehealth rooms difficult or expensive, clinicians can explore hybrid setups (e.g., [34]), such as going to the center for the first few sessions and then receiving home tele-services afterward. Third, in the worst-case scenario, where a locality has little to no network coverage [18], clinicians can attempt to supplement in-person or synchronous services with asynchronous alternatives (e.g., viewing learning materials uploaded to a Facebook group [51]; videotaping performance for the clinician to review later [45]). In principle, telepractice would benefit clinicians and clients in the Philippines because they can use an eclectic approach to increase the frequency of AAC services despite limited human, financial, and/or technological resources. This advantage is in line with the third item in the Department of Health's action agenda (2023-2028): "leveraging digital health and technology for efficient and accessible health service delivery" [69].

Aside from increasing access, telepractice may also decrease the costs involved in AAC intervention. Although only one study in the review focused on cost-effectiveness [37], this study found that home-based tele-AAC services cost much less than home-based in-person services. In the Philippine context, home-based tele-AAC services are probably also cheaper than clinic-based in-person services. A local feasibility study on general telerehabilitation showed that clients with mobility restrictions were able to save on transportation costs and reallocate the money to other healthcare expenses [70]. These savings are likely significant to AAC clients since AAC devices alone are costly [62] and they are currently not covered by the Philippine Health Insurance Corporation's (PhilHealth) Z packages [71]. Such potential financial benefits are in line with the rationale of the Universal Health Care Act, which aims to provide Filipinos with high-quality healthcare without exhausting their financial resources [72].

For places in the country with relatively more resources, telepractice might enable clinicians to maximize AAC outcomes. As suggested by a big portion of the studies in the review, one strategy is augmenting direct intervention services with online training, coaching, consultation, and/or support group services. Improving caregivers' AAC knowledge, skills, and attitudes may facilitate greater generalization of skills [73] and decrease the chances of AAC abandonment [74]. Interviews and focus group discussions with Filipino parents of AAC users also revealed caregivers' desire for more AAC training and support [62]. Aside from incorporating training and other services, clinicians can also leverage telepractice to increase collaboration with the other members of the AAC team (i.e., other professionals, family members, clients). In this review, the majority of the studies involved only SLPs or AAC researchers working alone. Globally, the lack of collaboration among professionals from various disciplines has often been mentioned as a point of frustration among AAC clients [75]. This gap has also been reported by SLPs [7] and parents of AAC users [70] in the Philippines. Telepractice can offer a solution to this problem [75], especially for teams or groups whose members do not work in the same place [76]. For instance, in one study included in this review [56], the organizer of the Sweden-based support group was in Västerås, whereas the facilitators live 5-6 hours away, in Kalmar. In the case of AAC-specific technical difficulties, telepractice can also decrease the number of meetings and prevent service delays by bring together the client, the clinican, and the technical support person in the same session [11]. In one study in this review [39], some intervention sessions involved both the SLP and the AAC vendor's representative interacting with the client via Zoom.

Limitations

While measures were taken to ensure the extensiveness of the search (e.g., covering multiple databases, including gray literature, doing ancestral and

forward citation search), some studies may have been missed due to the set of search terms used. For example, unlike aided AAC which was explicitly covered in the search strategy (i.e., "speech-generating device", "communication board"), we did not use subordinate terms specific to unaided strategies (e.g., "gestures", "sign language"), so some of these studies may have been missed if they did not use the term "augmentative and alternative communication", AAC, or tele-AAC. In addition, some gray literature would have also been missed if they were not indexed in ProQuest Dissertations and Theses. Another obvious limitation of the search is how it ended in 2021. Several tele-AAC studies were published after that, which is expected as the COVID-19 pandemic must have brought attention to telepractice services. One of these more recent publications is a 2023 systematic review covering videoconferencing-focused studies published from inception until 2021 [77].

In terms of screening and selection, human factors might have led the team to miss a few articles. While writing this manuscript, two supposedly eligible papers [78,79] were discovered. They were scoped by our search but failed our title/abstract screening since the two members assigned to screen them both marked them as ineligible. To reduce such lapses in reading or encoding one's decision, it might have been more prudent to assign three screeners to each article. Aside from such clerical errors, there were also instances when the team found the 'service provision' eligibility criterion unclear. For example, there were studies in the 'gray area' such as researchers developing online training materials for parents without an implementation phase, or researchers training or supporting a big group of parents online. This confusion on what counts as service provision in telepractice can be attributed to the current lack of consensus on what counts as telehealth [80]. The aforementioned systematic review on tele-AAC, for example, included only synchronous services [77].

Despite these limitations, the large number of information sources covered and the measures applied to increase the protocol's rigor (e.g., following JBI's guidelines, training the screeners and data extractors, using a codebook, requiring consensus, taking extensive notes on decisions made) suggest that the picture of tele-AAC research drawn is likely largely representative of the state of tele-AAC research, at least until 2021.

Future Research Directions

Although some efficacy data are available (19 experimental studies; 15 of which are SCEDs), the review suggests the need to do more studies with designs that are less prone to bias [81]: SCEDs, especially those with controls (e.g., ABA design, ABAB design); randomized controlled trials (RCTs); and systematic review. SCEDs are common in AAC research due to the heterogeneity of the population [82]. However, it is common for these SCEDs to lack experimental control [82]. In fact, in this review, two studies [51,53] used an SCED with an AB design. AB designs may not be considered true experimental designs due to their lack of controls [82]. Aside from SCEDs, future research may also conduct RCTs when appropriate. Despite the heterogeneity of AAC users, RCTs have already been successfully implemented in some studies. For example, a recent study compared face-to-face with tele-AAC services through an RCT [83]. Aside from these, systematic reviews may also be conducted to appraise the studies found in this review. The quality of the evidence covered by this scoping review is unknown as it did not include a critical appraisal. Some related insights can be obtained from the aforementioned 2023 systematic review on tele-AAC services, however. Based on their chosen appraisal tools, the six studies on synchronous services provided 'weak to moderate' evidence and their risk of bias was high [77].

At a more basic level, there is a need to work towards equitable access to tele-AAC and other rehabilitation services [8]. The feasibility and efficacy of tele-AAC need to be investigated in more contexts to ensure its appropriateness for various regions and client populations. In the Philippines, researchers can start with descriptive studies similar to those covered in this review. Data from these studies can inform the creation of potentially effective interventions [65]. Considering the more salient challenges in the country, researchers can look into hybrid setups, asynchronous services, community/clinic/school/hospital telehealth centers with a remote AAC specialist partner, and team collaboration. Investigating these topics contributes to the 7th item in the National Unified Health Research Agenda: health systems strengthening toward universal health care (health service delivery) [84].

Conclusion

This scoping review of tele-AAC studies disseminated from 2002-2021 revealed that at least 30 studies exist, with the majority being small-scale and children-focused. The review revealed multiple ways to leverage telepractice for optimal AAC access and outcomes. The relatively numerous studies on training and coaching, in particular, make indirect services worth considering. However, as the studies covered seem preliminary and potentially not applicable to developing countries like the Philippines, future researchers are enjoined to gradually work towards collecting more contextualized evidence using designs that are less prone to bias.

Acknowledgments

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